



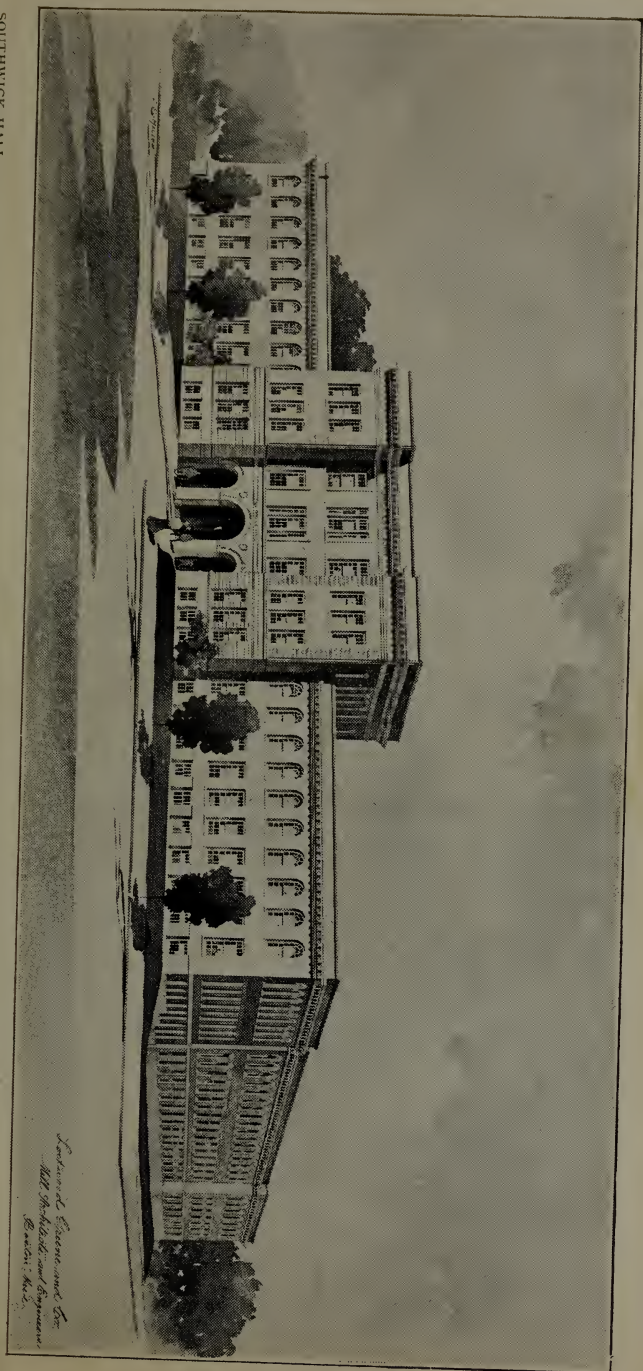
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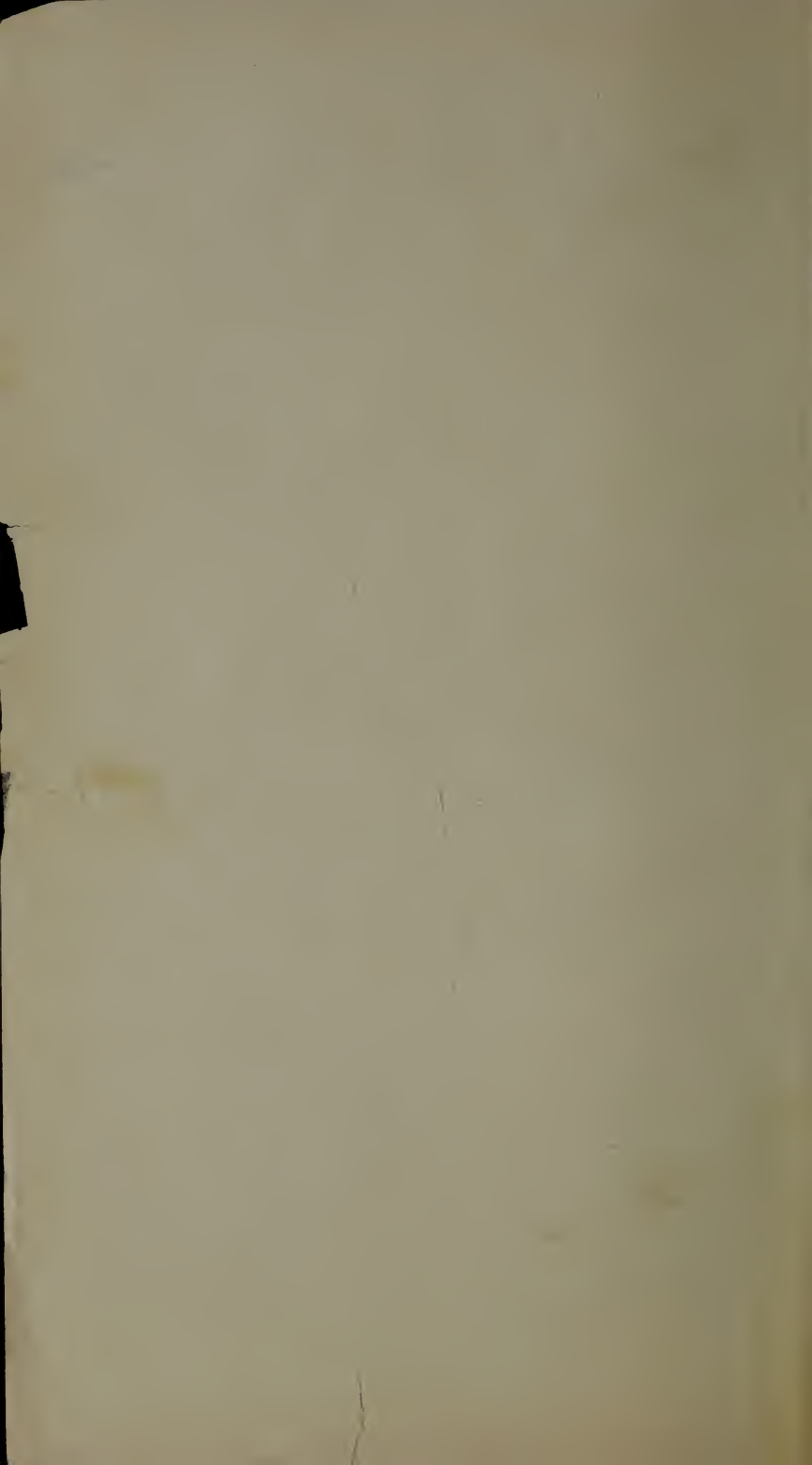
LOWELL TEXTILE INSTITUTE LIBRARY

Ac. No. **6276**

SOUTHWICK HALL.  
LOWELL TEXTILE SCHOOL.



*Southwick Hall, and the  
Lowell Textile School.  
Boston: 1852.*







LOWELL TEXTILE SCHOOL,  
LOWELL, MASS.

---

**APPLICATION BLANK.**

---

I, \_\_\_\_\_ hereby  
apply for admission to the Lowell Textile School.

Name in full, .....

Date and Place of Birth, .....

Home Residence, .....

Parent or Guardian, .....

Residence, .....

School last attended, .....

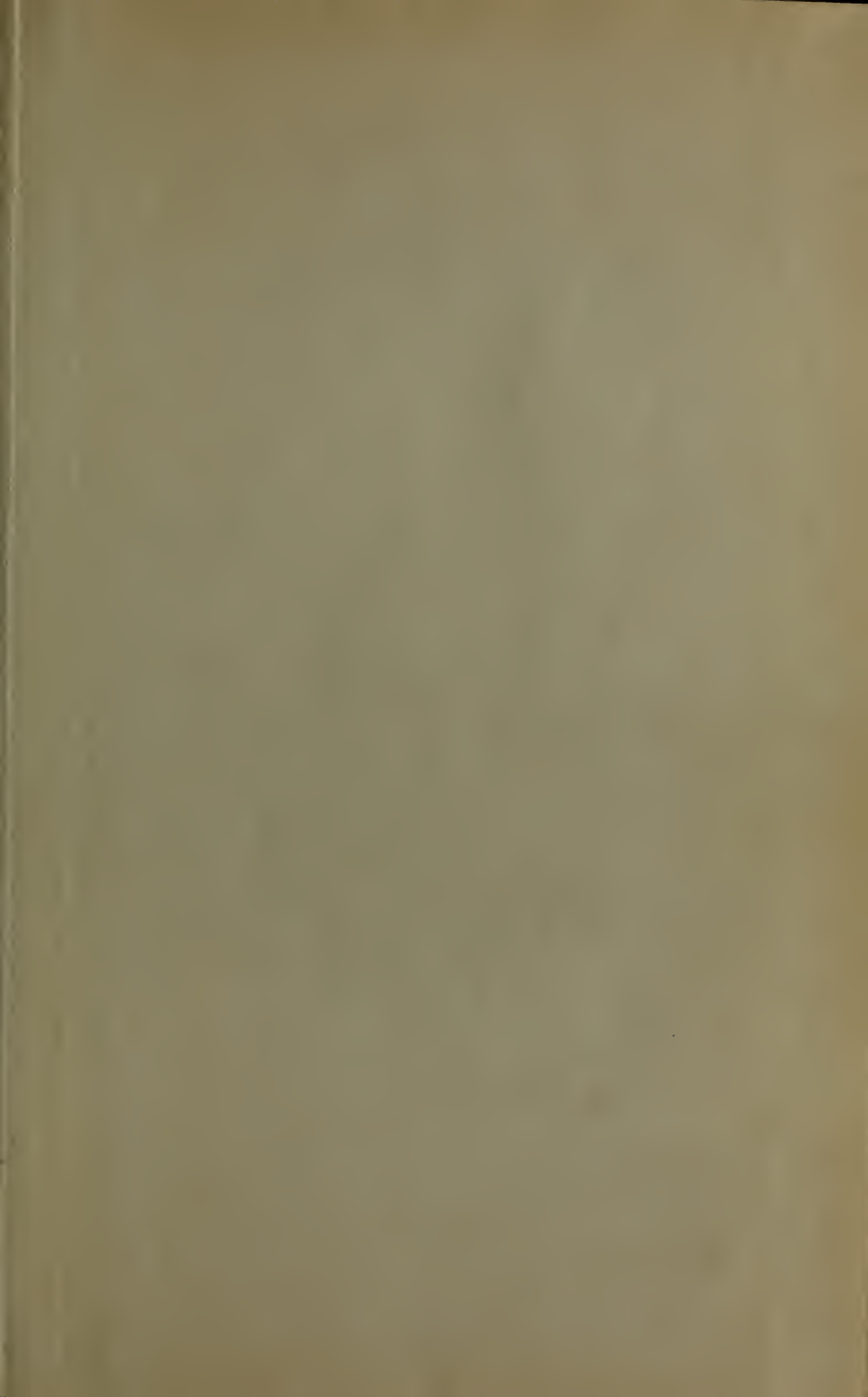
Course to be pursued at Lowell Textile School. (Not absolutely  
necessary to choose till the end of first term.)

DAY {  
I. Cotton Manufacturing.  
II. Wool Manufacturing.  
III. Designing.  
IV. Chemistry and Dyeing.  
V. Weaving.

EVEN-  
ING {  
I. Cotton Spinning.  
II. Woolen and Worsted Spin'ng  
III. Designing.  
IV. Chemistry and Dyeing.  
V. Weaving.  
VI. Mechanical Engineering.

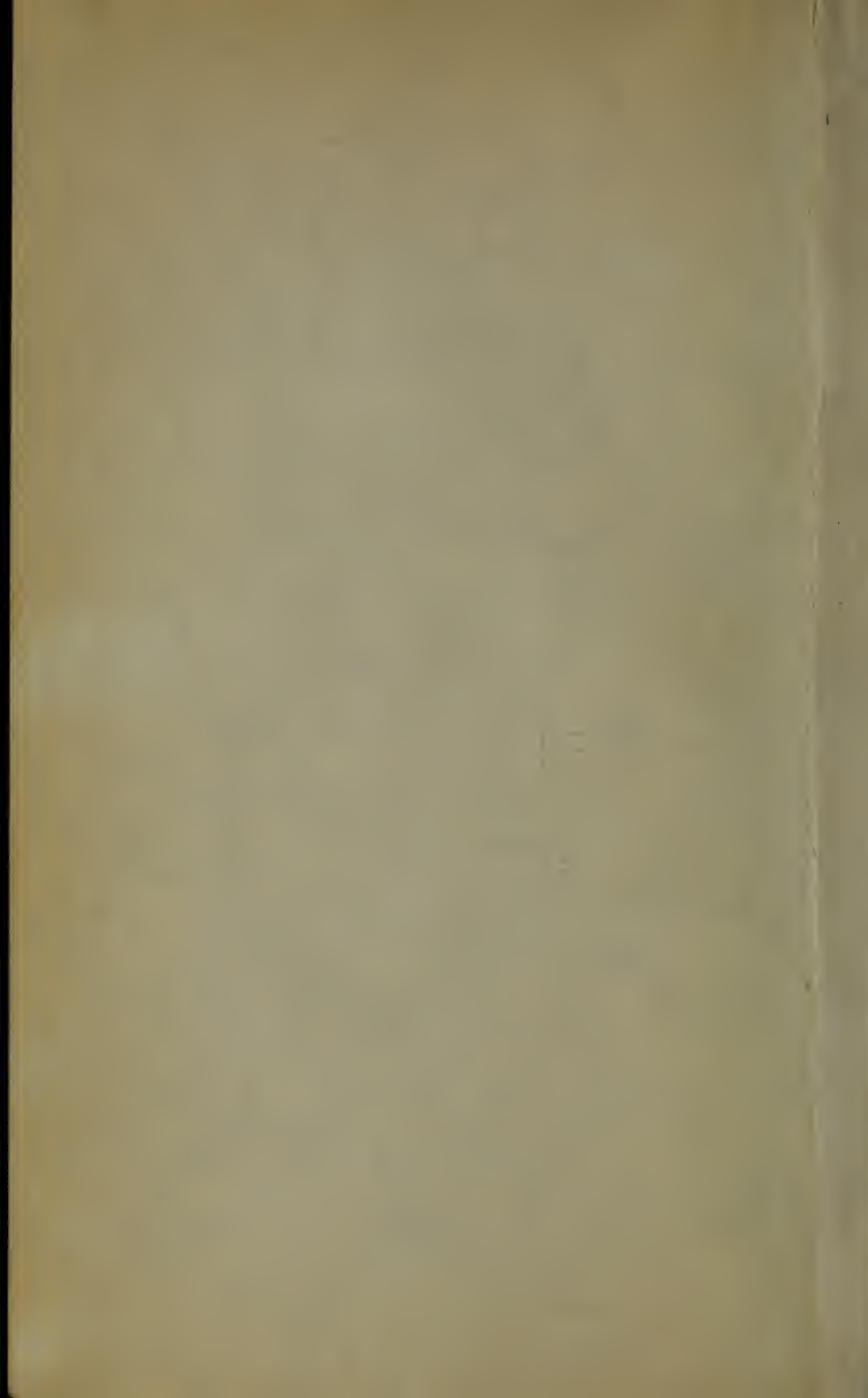
*Fill out the above and send to*

*WM. W. CROSBY, Principal.*









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# Trustees of the Lowell Textile School.

[INCORPORATED 1895.]

6276

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---

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WILLIAM NELSON.  
OTIS L. HUMPHREY.

# Calendar.

## 1901

Entrance examination for day students, Thursday, Sept. 26, at 10 A. M.

Entrance examinations for evening students, Thursday, Sept. 26, at 7 P. M.

School year begins (day) Tuesday, October 1.

Evening school year begins Monday, October 21.

Thanksgiving recess, Thursday, Nov. 28, to Saturday, Nov. 30, inclusive.

Christmas recess, Saturday, Dec. 21, to Wednesday, Jan. 1, 1902, inclusive.

## 1902

Semi-annual examinations, beginning Wednesday, January 22.

Second term begins Tuesday February 4.

Annual examinations begin Wednesday, May 21.

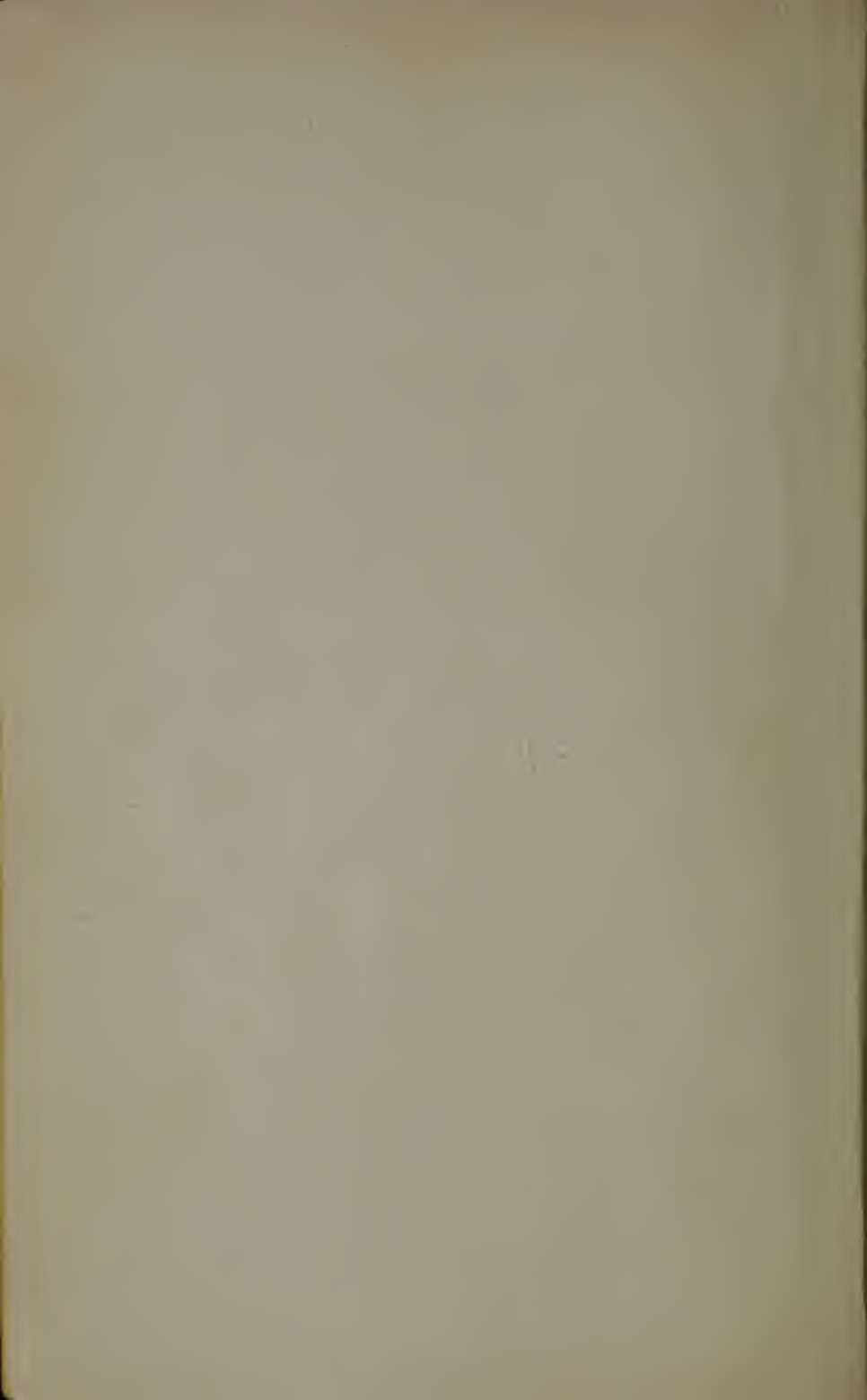
Diplomas awarded Thursday, June 5.

First entrance examinations Thursday, June 5, at 10 A. M.

There will be no sessions of the school on Washington's Birthday or on Patriots' Day.

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## THE LOWELL TEXTILE SCHOOL.

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The establishing of a school at Lowell for thorough instruction in the theory and practical art of manufacturing all fibres known to the textile industry, although proposed early in 1891, was not determined upon until the organization, methods and scope of such foreign schools, especially in England, France, Switzerland, Germany and Russia, had been carefully studied, and their permanence and value to the textile interests of those countries made clearly apparent.

The "Trustees of the Lowell Textile School" are incorporated under a special act of the Massachusetts Legislature, "for the purpose of establishing and maintaining a Textile school for instruction in the theory and practical art of textile and kindred branches of industry."

The incorporators are representatives either as president, treasurer, agent or superintendent, of the management of the great textile corporations of Lowell, Lawrence and vicinity in the Merrimack Valley with an aggregate capital of over \$65,000,000. By the terms of the By-Laws, at least three-fourths of the Trustees must be "persons actually engaged in or connected with textile or kindred manufactures." This insures the practical character of the management and instruction.

The School is located in Lowell, Massachusetts, the "Mother Textile City of America," the city and state affording financial aid and the manufacturers of New England being equally liberal in contributions. The advantages of the location at a textile centre where every commercial fibre enters into the products, the student thus being directly in touch with the textile industry and the management thereof, will be apparent.

The School was formally opened by His Excellency Gov. Wolcott on January 30, 1897, in the presence of a large gathering of gentlemen interested in textile industries from all parts of New England. Instruction was commenced on February 1, 1897, and the classes have been regularly conducted since that time, with ever increasing attendance.

## The Work of the School.

The principles of science and art are taught, not with the object of educating professional scientific men, but with a view to industrial and commercial applications; but the School offers to graduates of universities and scientific institutions the advantage of technical instruction in the practical application of certain sciences. It also offers special facilities to those entering commercial life for obtaining such knowledge of the construction of textile fabrics and of the languages of foreign commerce as is essential in the marketing of goods abroad.

The equipment of the School consists of high grade machinery with all latest improvements, specially built to afford facilities for all kinds of experimental work, and of such variety as is never found in any one textile mill. With all the machinery that is already installed, the School has a more extensive equipment than any other existing textile school either in America or Europe.

The staff of lecturers and instructors includes gentlemen from the leading scientific and art institutes of Europe and America, and also those who have had special experience in textile school work and in the various processes of textile manufacture, it having been from the first the purpose of the management to furnish as thorough scientific instructors in textiles and textile machine manufacture as is furnished by any technological institution in the branches of industry to which it relates.

## Day Classes.

These are especially intended for the instruction of those whose intention it is to enter the business of textile manufacturing in any branch. The courses are sufficiently complete to enable one to start without any previous acquaintance with textiles; but at the same time those who have been engaged in such business and wish to improve their knowledge and opportunities, can devote their entire time to study most profitably.

The complete collection of machinery enables every process to be practically illustrated.

The student has the option of selecting any one of five regular or several special courses.



Each course is intended to cover three years. It is optional whether or not a student continues the full course of three years, but this is strongly recommended.

There is *one term* of preliminary instruction, which is common to all courses. At the end of this term, each student is required to select which of the courses he is to follow in his subsequent studies, and the instruction to be given after the first term of the first year is specialized to suit each course.

The five regular diploma courses are:

- I. Cotton Manufacturing.
- II. Wool Manufacturing.
- III. Designing. General Course.
- IV. Chemistry and Dyeing.
- V. Weaving.

### Evening Classes.

The second branch of the school work is intended to give thorough evening instruction to those who are engaged during the day in mills and work shops, to enable those who wish it, to perfect their knowledge of the branches in which they work, to acquire knowledge of other processes than those in which they are regularly engaged, and in the course of several winters to complete a thorough technical education without interfering with their daily duties.

Evening students have the option of entering for one or more of six different courses, and arrangements will be made as far as possible for them to take such a section of each course as is suitable to the student's daily occupation in the mill.

- I. Cotton Spinning.
- II. (a) Woolen Spinning. (b) Worsted Spinning.
- III. Designing.
- IV. Chemistry and Dyeing.
- V. Weaving.
- VI. Mechanical Engineering.

Courses I, III, IV and V require three years each; courses II (b) and VI two years, and course II (a) one year.

For the satisfactory completion of either of these courses, the certificate of the school will be awarded; the diploma of the school will be awarded in exchange for certificates of satisfactory completion of those subjects which go to make up any one of the several regular diploma courses.

In general it is possible to take up the study of two of the above evening courses concurrently.

The time devoted to practical work both day and evening is considerably longer than that devoted to lectures, and in order to make the instruction real and thorough, no student is allowed to pass to another machine or process until he becomes thoroughly acquainted with the one on which he is engaged.

### Women's Department.

Among the many fields in which woman has entered, none has been found in which her natural refinements of taste and skill can be used to better advantage than in designing; but natural ability though the prime requisite, is by no means all, for a certain amount of technical knowledge must be gained to achieve success. This department combines decorative art and textile design, and in general requires attendance on four afternoons per week.

### Commercial Department.

A special course in textile construction and foreign languages is arranged for those contemplating a commercial career.

All such are invited to communicate with the principal, since there is demanded in such a course a greater variety of combinations of studies than in the manufacturing courses.

### New Building.

Since the issue of the last catalogue, the School has received an additional gift of \$35,000 from Frederick Fanning Ayer, Esq., of New York City, and a like amount from the Commonwealth of Massachusetts, making in all \$70,000 from each of the foregoing, or a total of \$140,000 to be invested in a permanent home for the School. A lot of  $3\frac{1}{2}$  acres on the shore of the Merrimack River

just below the famous Pawtucket Falls has been secured, and Southwick Hall, named for Mr. Ayer's grandfather, is already in construction. The facilities in equipment offered in this building will give the School a foremost position.

### **Present Building and Equipment.**

The building in which the School is situated is of modern slow burning mill construction, equipped with freight and passenger elevators, steam heat, gas and electricity, the latter for both power and light. Each room is protected against fire by sprinklers and thermostats, and self-closing fire doors are provided. The humidifiers, motors, shafting, belting, etc., are installed in a most modern manner throughout.

The equipment of machinery is arranged so as to be the most complete of its kind in the world for textile educational purposes; the machinery and plant already in place is of a value of \$80,000, and is such as to enable the raw fibre to be treated in the School at every process until it becomes a woven fabric.

#### **The Equipment of the Cotton Spinning Department Includes :**

One Automatic Feeder, made by the Kitson Machine Co. Lowell, Mass.

One Single Beater Breaker, made by the Kitson Machine Co., Lowell, Mass.

One Single Beater Finisher, made by the Kitson Machine Co., Lowell, Mass.

One Top Flat Card, made by the Lowell Machine Shop, Lowell, Mass.

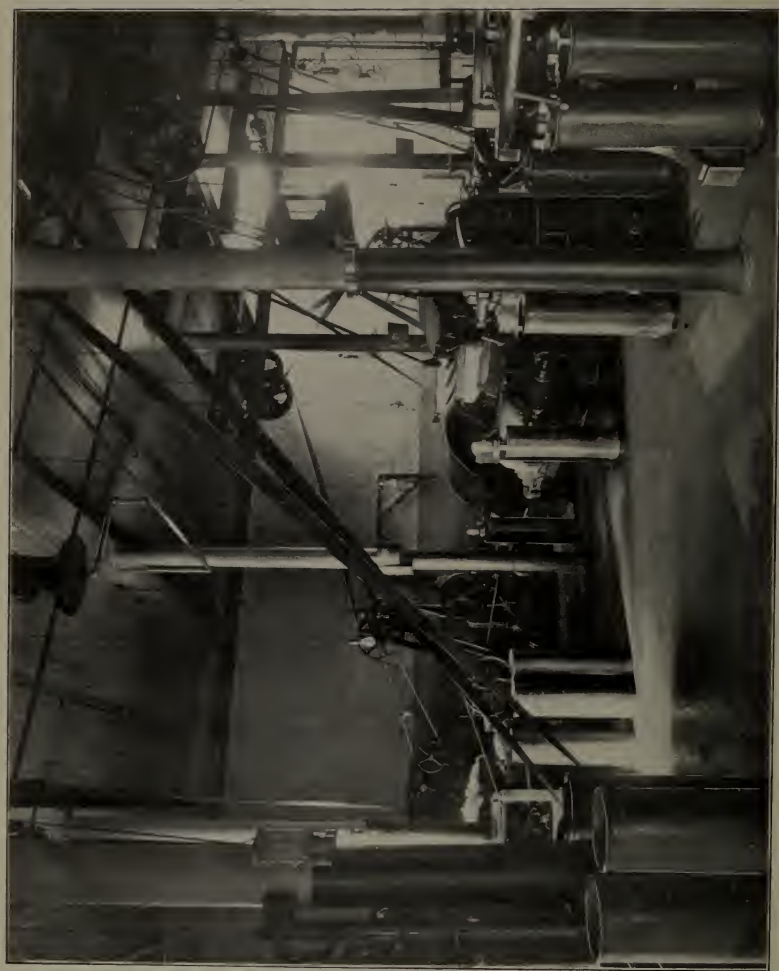
One Revolving Flat Card, made by the Lowell Machine Shop, Lowell, Mass.

Card Grinding Rolls, Stripping Rolls, etc.

One Sliver Lap Machine, made by the Mason Machine Works, Taunton, Mass.

One Comb, made by the Mason Machine Works, Taunton, Mass.

One Railway Head, made by the Lowell Machine Shop, Lowell, Mass.



COTTON PICKERS  
AND CARDS

One Drawing Frame, made by the Lowell Machine Shop, Lowell, Mass.

One Slubber, made by the Lowell Machine Shop, Lowell, Mass.

One Intermediate, made by the Lowell Machine Shop, Lowell, Mass.

One Fine Frame, made by the Lowell Machine Shop, Lowell, Mass.

One Ring Spinning Frame, made by the Lowell Machine Shop, Lowell, Mass.

One Spinning Mule, made by the Lowell Machine Shop, Lowell, Mass.

One Spooler, made by the Lowell Machine Shop, Lowell, Mass.

Wet and Dry Twister, made by the Draper Co., Hopedale, Mass.

One Reel, made by the Whitin Machine Works, Whitinsville, Mass.

One 50 Saw Gin.

One Prior Roller Gin.

### **The Woolen Spinning Department Includes :**

One Parkhurst Burr Picker, made by the Atlas Mfg. Co., Newark, N. J. .

One Mixing Picker, made by the Davis & Furber Machine Co., North Andover, Mass.

One set of three Woolen Cards, including :

First Breaker, with Bramwell Feeder, made by the Davis & Furber Machine Co., North Andover, Mass.

Second Breaker, made by the Davis & Furber Machine Co., North Andover, Mass.

Finisher, made by the Davis & Furber Machine Co., North Andover, Mass.

One Improved Breaker Feed, made by G. S. Harwood & Sons, Boston, Mass.

One Bramwell First Breaker Feed, made by G. S. Harwood & Sons, Boston, Mass.

One Torrance Balling Head and Creel, made by the Torrance Mfg. Co., Harrison, N. J.



Apperly Feed, made by G. S. Harwood & Sons, Boston, Mass.

One Spinning Mule, 120 spindles, made by the Davis & Furber Machine Co., North Andover, Mass.

One Twister, made by the Davis & Furber Machine Co., North Andover, Mass.

One Roy Grinding Frame, made by B. S. Roy, Worcester, Mass.

One Roy Traverse Grinder, made by B. S. Roy, Worcester, Mass.

### **The Worsted Spinning Department Includes :**

One 50-inch Double Worsted Card (4 lickerin), made by the Davis & Furber Machine Co., North Andover, Mass., and the following made by Prince, Smith & Son, Keighley, England:

One Revolving Creel for 12 Balls.

One Double Head Can Gill Box.

One 2 Spindle Gill Box.

One 2 Spindle Drawing Box.

One 2 Spindle Weigh Box.

One 4 Spindle Finisher.

One 12 Spindle Dandy Rover.

One 12 Spindle Cap Spinner.

One 12 Spindle Flyer Spinner.

One 12 Spindle Ring Spinner.

One 12 Spindle 2 Fold Cap Twister.

One 12 Spindle 6 Fold Ring Twister.

From Hall & Stell, Keighley, England:

One Gill Box, before combing.

One Gill Box after combing.

One Noble Worsted Comb, from Crompton & Knowles, Worcester.

One Balling Box, from same firm.

One 6 Head Universal Winder, for Cones and Tubes.

### **The Cotton Warp Preparation Department Consists of :**

One Spooler, made by the Lowell Machine Shop, Lowell, Mass.

One Warper, made by the Lowell Machine Shop, Lowell, Mass.

One Slasher, made by the Lowell Machine Shop, Lowell, Mass.  
One Beamer, made by T. C. Entwistle, Lowell, Mass.  
Drawing-in Frames, etc.

### **The Woolen and Worsted Warp Preparation Department Consists of:**

One Warp Spooler, made by the Davis & Furber Machine Co., North Andover, Mass.

One Dresser, made by the Davis & Furber Machine Co., North Andover, Mass.

One Reel, made by the Davis & Furber Machine Co., North Andover, Mass.

One Beamer, made by the Davis & Furber Machine Co., North Andover, Mass.

One 48 Spool Creel, made by the Davis & Furber Machine Co., North Andover Mass.

Also a number of hand warping and beaming frames.

### **The Weaving Department,**

which is the most complete in the world, with regard to the variety of looms, consists of:

One Plain Northrop Loom, made by the Draper Co., Hopedale, Mass.

One Plain Print Cloth Loom, made by the Whitin Machine Works, Whitinsville, Mass.

One Side Cam Twill Loom, made by the Whitin Machine Works, Whitinsville, Mass.

One Five Harness Heavy Loom, made by the Lowell Machine Shop, Lowell, Mass.

One Plain Print Cloth Loom, made by the Mason Machine Works, Taunton, Mass.

And the following looms made by the Crompton-Knowles Loom Works, Worcester, Mass., and Providence, R. I.

One Knowles Gingham Loom, 4 boxes.

One Knowles Fancy Cotton Loom, with 20 harness dobby, 4 boxes.

One Knowles Fancy Cotton Loom, with 25 harness dobby.

One Knowles Blanket Loom, with 25 harness dobby, 4 boxes.





RAILWAY HEAD, DRAWING  
FRAME, AND COMB

One Knowles Gem Loom, 20 harness, 4x4 boxes.  
 One Knowles Worsted Loom, 32 harness.  
 One Knowles Fancy Loom, with single lift jacquard.  
 One Knowles Fancy Loom, with double lift jacquard.  
 One Knowles Fancy Loom, with jacquard tied up for leno.  
 One 1200 Hook Halton Jacquard Head Motion, arranged to be transferred to different looms.  
 One Knowles Ingrain Carpet Loom, 4x4 boxes.  
 One Crompton Gingham Loom, 4 boxes.  
 One Crompton Fancy Loom, 6x1, with double cylinder 20 harness dobby.  
 One Crompton Fancy Cotton Loom, with single cylinder 20 harness dobby.  
 One Crompton Jean Loom.  
 One Crompton Lappet Loom, with 16 harness dobby.  
 One Crompton Towel Loom.  
 One Crompton Ingrain Carpet Loom, 4x4 boxes.  
 One Crompton Worsted Loom, 27 harness.  
 One Crompton Worsted Loom, 24 harness, 4x4 boxes.  
 One Crompton & Knowles Heavy Loom, 20 harness, 4x4 boxes.  
 One Lewiston Machine Co. Loom, 4 harness, side cam.  
 One Lewiston Machine Co., Bag Loom.  
 There are also the following hand looms, viz. :  
 Twelve Hand Looms, 2x3 boxes, with 20 harness dobby.  
 Eight Hand Looms, 4x4 boxes, with 24 harness dobby.  
 Six Hand Looms, 3x3 boxes, with 32 harness dobby.  
 Six Hand Looms, 4x4 boxes, with 30 harness dobby.  
 Two Hand Looms, with treadles.  
 Two Hand Looms, 4x4 boxes, with 200 hook jacquard.  
 Two Hand Looms, 3x3 boxes, 200 hook jacquard.  
 Two Hand Looms, 3x3 boxes, with 600 hook jacquard.  
 One Jacquard piano card cutting machine, from John Royle & Sons, Paterson, N. J.

### **The Silk Machinery Consists of:**

One Winder, made by the Atwood Machine Co., Stonington, Conn.

One Quiller, made by the Atwood Machine Co., Stonington, Conn.

One Warper, made by the Atwood Machine Co., Stonington, Conn.

One Beamer, made by the Atwood Machine Co., Stonington, Conn.

One Doubling Frame, made by the Atwood Machine Co., Stonington, Conn.

### **Motive Power, Etc.**

One 30 horse-power motor, by the General Electric Co., Schenectady, N. Y.

Two 20 horse-power motors, made by the Westinghouse Electric and Manufacturing Co., Pittsburgh, Pa.

One  $2\frac{1}{2}$  horse-power motor, made by N. E. Motor Co., Lowell, Mass.

One 1 horse-power motor.

One  $\frac{1}{8}$  horse-power motor.

One complete system of fire protection, including sprinklers, air pressure system, thermostats, and other appliances, by the General Fire Extinguisher Co., Providence, R. I.

One complete humidifying plant, by the American Drosophore Co., Boston, Mass.

One complete humidifying plant, by the U. S. Aerophor Air Moistening and Ventilating Co., Providence, R. I.

### **The Dyeing Department**

is fully equipped with complete chemical laboratory with individual benches, also small machines for dyeing, and other processes.

Calico printing machines, made by Mather & Platt, Oldham, England.

One hydro-extractor, from W. H. Tolhurst & Sons, Troy, N. Y.

One jig dyeing machine.

One jacketed iron steaming chamber, from A. Edmeston & Son, Salford, England.

One drying chamber.

One ageing chamber.

One set steam jacketed copper kettles, evaporating benches, etc.

The School is well equipped with reels, balances, electrolytic and other scientific instruments for experimental purposes.

### **Knitting Department.**

One Mayo automatic seamless knitting machine.

One spring kneedle cut hose machine.

One latch kneedle ribbed hose machine.

### **Finishing Department.**

One Rodney Hunt fulling mill.

One string washer.

Hydro extractor.

Tenter bars, driers, etc.

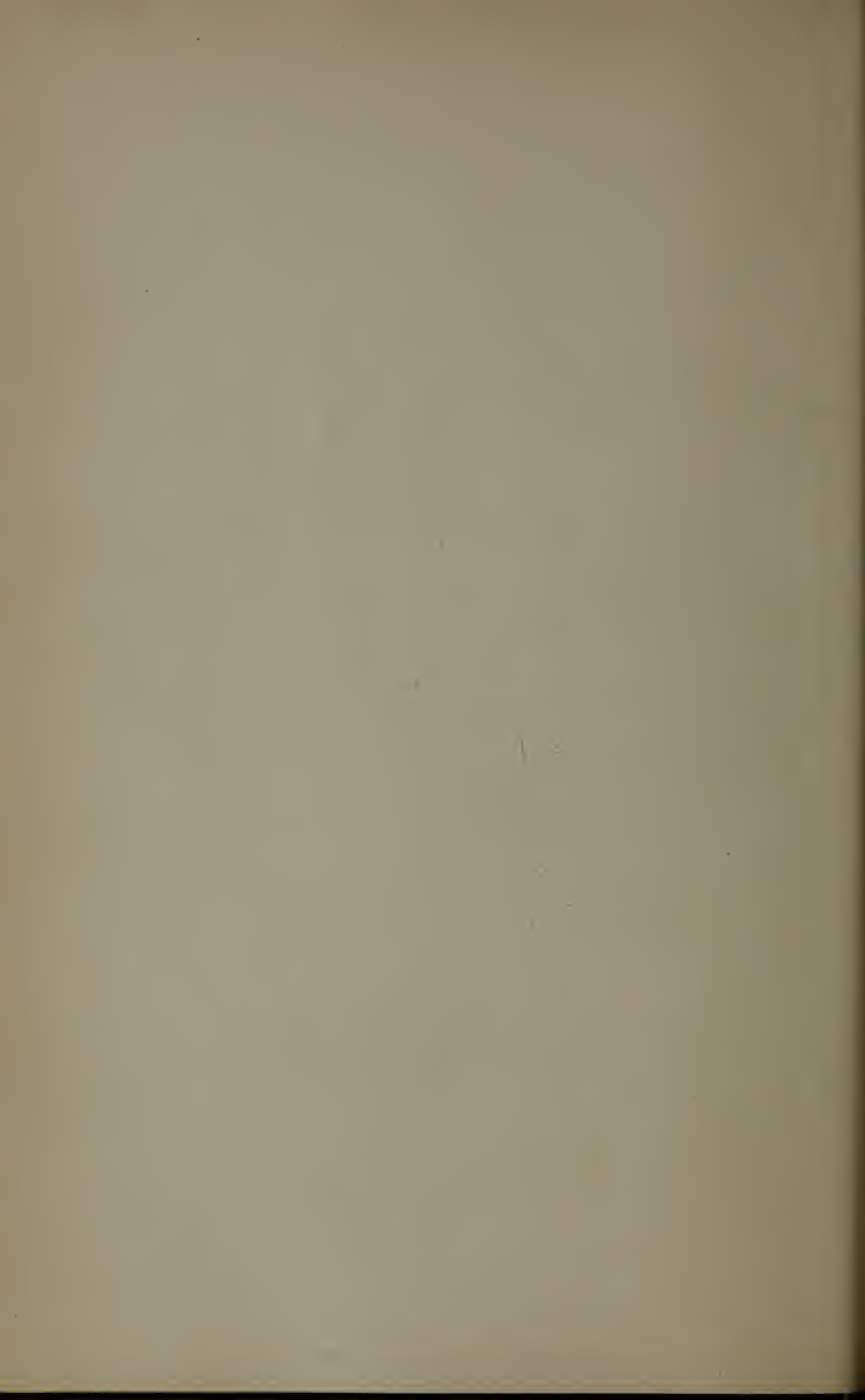
One wire napper.

Gig.

One double shear, from Parks & Woolson Machine Co. Press.

Steam brush.





## DAY STUDENTS.

### ENTRANCE QUALIFICATIONS.

Candidates for admission to the day classes may present to the Principal such evidence as may be obtainable, whether degree, diploma or certificate, at any time. For all others, there will be held examinations, as stated in calendar; candidates failing to pass at June examinations will be allowed to try again in September; those who cannot attend the June examinations, may present themselves in September; if conditioned, a further examination will be appointed. Preparation in general will be as follows :

#### ARITHMETIC.

Definitions; elementary operations in addition, subtraction, multiplication and division; squares; cubes; square root; interest, discount; fractions, simple and complex; decimals; percentage; ratio and proportion.

#### ENGLISH.

The candidates will be expected to correct examples of bad English, both for spelling, punctuation, capitalization, grammar and sense; also to write a short composition on a given theme (some familiar one) to show a knowledge of language and method of expression.

#### GEOGRAPHY.

Location of principal countries, with capitals, large rivers, mountains, etc.; noting characteristics of climate, productions and inhabitants. General statements rather than specialization will be sought.

#### ALGEBRA.

(During 1901 this subject will not be required for entrance, provision being made for it during the first term; but it will doubtless be asked for subsequently.)

Definitions ; fundamental operations, parentheses ; factoring ; highest common factor ; least common multiple ; fractions, simple and complex ; simple equations, one or more unknown quantities ; involution and evolution ; square and cube root ; logarithms.

#### APPLICATION BLANK.

A blank form of application may be found at the end of this book.





## PREPARATORY SCHOOLS.

For those who intend to take Chemistry and Dyeing, physics is almost indispensable; and while the preparation afforded by the modern grammar school will enable the student to complete either of the courses at this school, the increased advantages of the equivalent of a high school training cannot be over-estimated. In such a preparatory course, particular attention should be given to algebra, geometry, manual training, chemistry, physics (including mechanics, heat, light and electricity), French and German.

### OPTIONAL COURSES.

During the present year optional courses are offered in advanced algebra, German, Spanish and French at the School.

It will be noticed in the regular courses several options are given.

### ADVANCED STANDING.

Candidates who may have received previous training in any of the subjects ordinarily taken in the regular courses may present themselves for examination in such a subject on Friday, September 27, 1901. If a satisfactory rank be attained, they will be given such further work as will be best suited to their advancement.

### FEES.

The fee for the day course is \$100 per year for residents of Massachusetts; for non-residents it is \$150 per year.

Five-eighths of the fee is payable on or before Oct. 10, the balance on or before Feb. 10, of each year. After payment is made, no fee or part thereof can be returned, except by special action of the trustees.

Special students pay, in general, the full fee, but if a course be taken involving attendance at the school during a limited time, application may be made to the Principal for a reduction.

Students must provide their own books, stationery, tools, overalls, etc., and pay for any breakage or damage that they cause. The above fee includes free admission to any of the evening classes in which there is accommodation should any day student desire to attend.

A deposit of \$15 will be required to cover the cost of breakage in the chemical laboratory, the unexpended balance to be returned to the student at the end of the year.

The fees for the evening classes vary and are indicated elsewhere.

Fees are strictly payable in advance, and no student will be admitted to the classes until his fees are paid and he has filed an attendance card.

### EXAMINATIONS.

Examinations will be held at the end of each term.

Students who do not show sufficiently satisfactory progress in the final examinations at the end of the first year will not be admitted to the second year classes, and the same applies to second year students with reference to their admission to the third year classes.

Intermediate examinations will be held, which will serve to inform the student as to progress made, or lack of it, and may be appointed at any time.

In general, the examinations will cover the work of the preceding term, but at the end of the third year candidates for diplomas may be examined on all preceding work.

Daily work and regularity of attendance will also be considered in making up the reports of standing.

### REPORTS OF STANDING.

Twice during each term informal reports are sent to students, or to guardians of such as are not of age; and at the end of each term formal reports are made.

### ATTENDANCE CARD.

At the beginning of each term all students must fill out and file with the Principal on blank forms which are provided, a for-

mal application for such subjects as he may choose, subject to the approval of the Principal. When an attendance card is once approved, no change can be made except through the Principal.

### THESIS.

All candidates for the diploma of the school must file with the Principal not later than May 15, a report of original investigation, or research, written on a good quality of paper, 8x10 inches, with one inch margin at left, and  $\frac{1}{2}$  inch at right of each page; such thesis to have been previously approved by the head of the department in which it is made.

### GRADUATE COURSE.

Graduates of technical courses of other schools are invited to communicate with the Principal with reference to special courses in the textile studies. Previous training in the engineering branches will usually reduce materially the time necessary to complete either of the courses at this school. The advantages offered to such persons for special research work are unexcelled, and a most profitable course may be arranged.

### DIPLOMA.

The diploma of the School is awarded upon the satisfactory completion of either of the five regular courses, covering not less than three years, except where entrance is to advance standing. In such cases at least one year's residence will be required.

### CERTIFICATE.

For the satisfactory completion of a three years' course in any special department, the certificate of the School will be awarded; it is possible to complete such a course in less than three years, if the candidate be passed to advanced standing, but at least one year's attendance will be required.

### PAYMENTS.

All payments should be made to Wm. W. Crosby, Principal. If by check, remittance from points outside of New England should be in Boston funds.

## MEDAL OF HONOR.

The New England Cotton Manufacturers' Association offers annually a medal to that member of the graduating class who shall be selected by a committee of the Association as best fitted to receive it.

## CONDUCT.

Day students will be expected to attend all lectures, classes and demonstrations of practical work, except when permission to be absent has been obtained from the Principal. In cases of sickness, or other unavoidable absence, written explanation must be sent.

Books will be prescribed for study and for entry of lecture notes and other exercises, and will be periodically examined by the lecturers. The care and accuracy with which these books are kept will be considered in awarding marks.

Students are required to return to the proper place all instruments or apparatus used in experimental work and to leave all machinery and apparatus with which they may experiment clean and in working order.

In the cases of either day or evening students, irregular attendance, lack of punctuality, neglect of either school or home work, disorderly or ungentlemanly conduct, or general insubordination, will be considered good and sufficient reasons for the suspension of a student by the Principal, and for his subsequent removal from the School and forfeiture of all school privileges, if the President of the School so decides.

Apparatus used in the Dyeing or Chemical Laboratory will be provided by the School, but a deposit must be made by the student at the beginning of the term sufficient to cover its cost, and this deposit will be returned to him at the close of the term, subject to such deduction as will reimburse the School for broken or damaged articles.

## LIBRARY.

The School Library is supplied with all the leading textile books and with works dealing with science, art or industries allied to the textile trades. The leading textile trade papers are kept on file.

## SESSIONS.

The regular school sessions will be in general from 9 A. M. till 1 P. M., and from 2.15 to 5 P. M., except Saturdays, when the building will be closed in the afternoon.

A schedule will be prepared showing the time to be devoted to each subject and the hours at which the various classes meet. This will be rigidly adhered to and the register will be marked for each lecture or demonstration.

## GENERAL.

Students from a distance, requiring rooms and board in the city, may, if they desire it, select the same from a list which is kept at the School. The cost of rooms and board in a good district is from \$4 per week upwards.

All raw stock and yarn will be provided by the School and all the productions of the School remain, or become, the property of the Trustees, except by special arrangement, but each student will be allowed to retain specimens of yarn or fabrics that he has produced, if mounted and tabulated as prescribed by the Principal, and facilities will be given for the preparation of a collection of such fabrics as are produced in the School, with all the instruction for their manufacture. It is understood that the Trustees may retain in the School such other specimens of students' work as the Principal may determine.

Prospective students who are desirous of arranging special courses by omitting a portion of one course, adding a portion of another, or in any other way, are invited to communicate with the Principal.

An additional entrance examination to suit the convenience of students from a distance (out of New England), will be arranged.

Lock boxes will be provided for the use of students, sufficiently capacious to contain clothing, books and tools. A deposit of 25 cents will be required, which will be returned to the student upon the surrender of the locker key.

No books, instruments or other property of the School will be loaned to the students, or allowed to be removed from the premises,

Facilities will be given for visits by day students to New England mills and works during the session.





RING AND  
DRAWING FRAMES

## MATERIALS.

Students must purchase such tools, instruments, text books and apparatus as may from time to time be recommended by the head of each department, and the cost of these for day students will be from \$10.00 to \$15.00, and for evening students from \$1.00 upwards, according to the subject studied.

## THE REGULAR COURSES.

The title of each of the regular courses is an indication of the particular nature of the course, unless it be in the case of Course III. There is a considerable demand for a general textile course in which the whole subject may be treated broadly; this course is organized with this particular object in view, although various options are offered, in which some one branch may be followed at length.

Certain general studies are included in each course, in order that in specializing a too narrow view may be avoided; for in this branch of the world's industries, there have been too many short sighted policies in the past, and it is to be hoped that the broadening influence of the textile school may help to usher in a new era.

## SPECIAL COURSES.

While it is always urged that regular courses be followed if possible, there is opportunity to make special arrangements to fit for particular positions, as for example:— yarn mill, weaving special fabrics, designing, etc., and, owing to the large number of possibilities, those desiring such courses are invited to correspond with the Principal.

## GOLD MEDAL.

The Lowell Textile School was awarded a Gold Medal at the Paris Exposition, 1900, for general excellence.





# COURSES OF INSTRUCTION.

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## DAY CLASSES.

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(For details of the several subjects see subsequent pages, beginning with page 41.)

### FIRST YEAR—FIRST TERM.

(Common to all courses.)

Design Construction.	Cloth Construction
Cloth Analysis.	Hand Looms.
Elements of Mechanism.	General Chemistry.
Mechanical Drawing.	Freehand Drawing.

## Course I. — Cotton Manufacturing.

### FIRST YEAR—FIRST TERM.

(Common to all courses, see above.)

### FIRST YEAR—SECOND TERM.

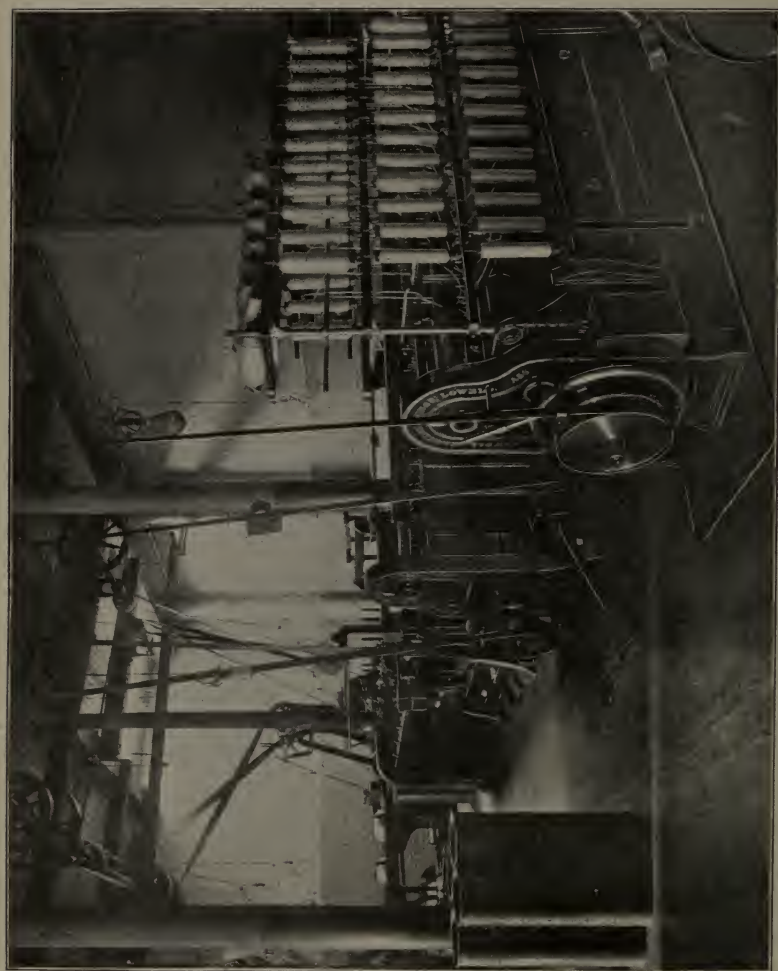
Cotton Fibre.	Cotton Manipulation.
Microscopic Examination of Fibre.	Cloth Construction.
Design Construction.	Hand Looms.
Cloth Analysis.	General Chemistry.
Elements of Mechanism.	Freehand Drawing.
Mechanical Drawing.	

### SECOND YEAR—FIRST TERM.

Cotton Manipulation.	Applied Mechanics.
Machine Drawing.	Warp Preparation.
Textile Chemistry and Dyeing.	Weaving.
Designing.	Cloth Analysis.
Hand Looms.	

### SECOND YEAR—SECOND TERM.

Cotton Manipulation.	Applied Mechanics.
Machine Drawing.	Weaving.
Textile Chemistry & Dyeing.	Designing.
Cloth Analysis	Hand Looms.



FLY FRAMES

### THIRD YEAR.

Cotton Manipulation.	Designing.
Weaving.	Mill Engineering.
Knitting Machinery.	Thesis.

## Course II. — Wool Manufacturing.

### FIRST YEAR—FIRST TERM.

( Common to all courses, see page 35. )

### FIRST YEAR.—SECOND TERM.

Wool Fibre.	Woolen Spinning.
Microscopic Examination of Fibres.	
Design Construction.	Cloth Construction.
Cloth Analysis.	Hand Looms.
Elements of Mechanism.	General Chemistry.
Mechanical Drawing.	Freehand Drawing.

### SECOND YEAR.—FIRST TERM.

Woolen Spinning.	Applied Mechanics.
Machine Drawing.	Warp Preparation.
Weaving.	Designing.
Textile Chemistry and Dyeing.	
Cloth Analysis.	Hand Looms.

### SECOND YEAR—SECOND TERM.

Worsted Spinning.	Applied Mechanics.
Machine Drawing.	Weaving.
Textile Chemistry and Dyeing.	Designing.
Cloth Analysis.	Hand Looms.

### THIRD YEAR.

Wool Manipulation.	Designing.
Weaving.	Mill Engineering.
Knitting Machinery.	Thesis.

## Course III. — Designing.

### FIRST YEAR—FIRST TERM.

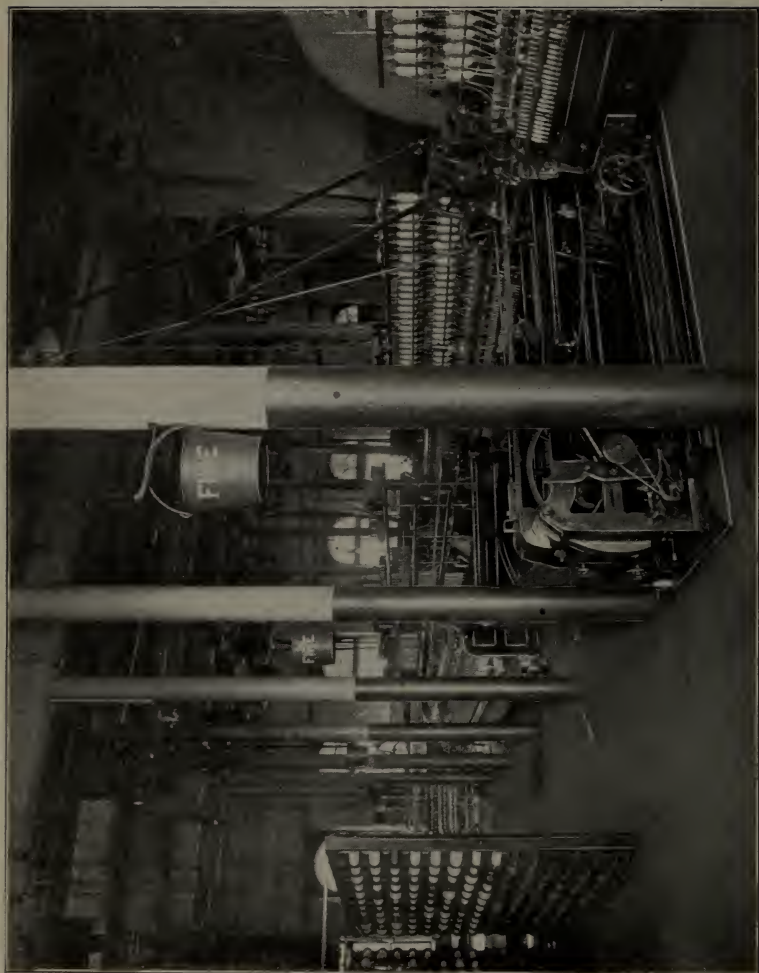
( Common to all courses, see page 35. )

### FIRST YEAR—SECOND TERM.

Design Construction.	Cloth Construction.
Cloth Analysis.	Hand Looms.
Design Sketching.	Freehand Drawing.
Mechanical Drawing.	General Chemistry.
Elements of Mechanism.	

### Options :

Woolen and Worsted Spinning. Cotton Spinning.



COTTON MULE

SECOND YEAR.

Design Construction.	Cloth Construction.
Cloth Analysis.	Hand Looms.
Design Sketching and Jacquard Work.	
Decorative Art.	Weaving.
Textile Chemistry and Dyeing.	Applied Mechanics.
Options :	
Woolen and Worsted Spinning.	Cotton Spinning.

THIRD YEAR.

Designing.—Advanced Work.	Weaving.
Mill Engineering.	Thesis.
Options :	
Decorative Art.	Woolen and Worsted Spinning.
Cotton Spinning.	

## Course IV.—Chemistry and Dyeing.

FIRST YEAR—FIRST TERM.

(Common to all courses, see page 35.)

FIRST YEAR—SECOND TERM.

General Chemistry.	Qualitative Analysis.
Stoichiometry.	Mechanical Drawing.
Elements of Mechanism.	Designing.
Cloth Analysis.	Hand Looms.

SECOND YEAR.

Textile Chemistry and Dyeing.	Advanced Inorganic Chemistry.
Chemical Philosophy.	Organic Chemistry.
Applied Mechanics.	
Options :	
Designing.	Weaving.

THIRD YEAR.

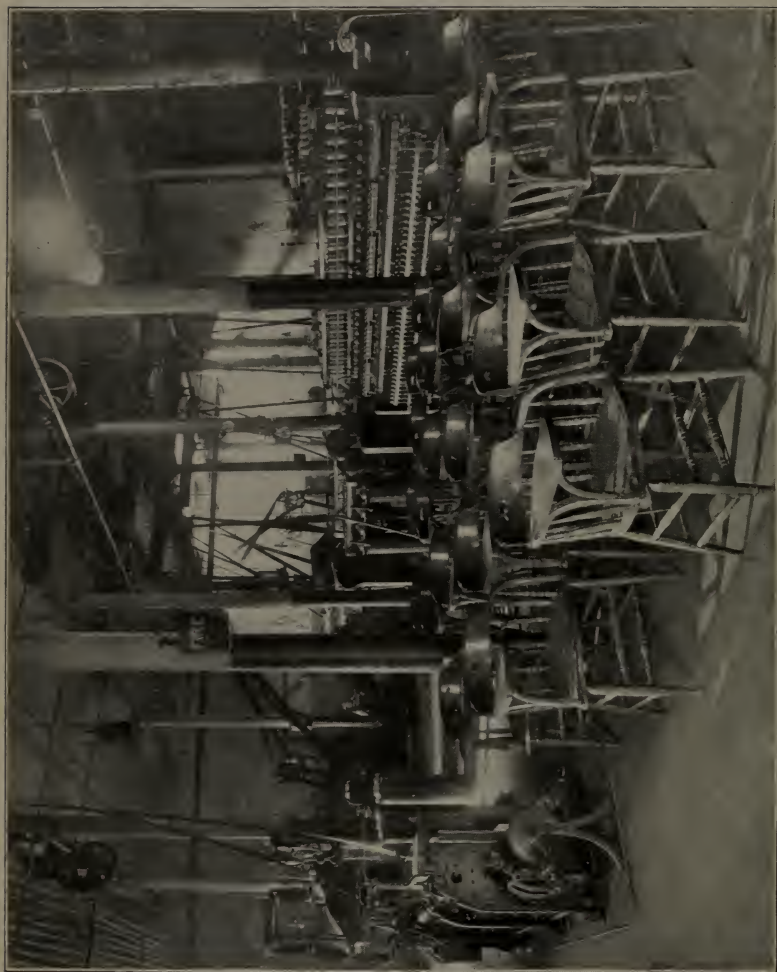
Quantitative Analysis.	Industrial Chemistry.
Advanced Textile Chemistry and Dyeing.	
Dye Testing.	Microscopy.
Thesis.	
Options :	
Weaving.	Mill Engineering.

## Course V.—Weaving.

FIRST YEAR—FIRST TERM.

(Common to all courses, see page 35.)





FLY AND RING  
FRAMES



# FIRST YEAR—SECOND TERM.

Design Construction.	Cloth Construction.
Cloth Analysis.	Hand Looms.
Freehand Drawing.	Mechanical Drawing.
Elements of Mechanism.	General Chemistry.

## Options:

Woolen and Worsted Spinning.	Cotton Spinning.
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# SECOND YEAR.

Design Construction.	Cloth Construction.
Cloth Analysis.	Hand Looms.
Decorative Art.	Loom Construction.
Textile Chemistry and Dyeing.	Weaving.

## Applied Mechanics.

## Options:

Woolen and Worsted Spinning.	Cotton Spinning.
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# THIRD YEAR.

Fabric Structure.	Cloth Construction.
Cloth Analysis.	Hand Looms.
Analysis of Weaving Mechanism.	
Weaving.	Thesis.

## Mill Engineering.

## Cotton Spinning Department.

### First Year.

1. The Cotton Fibre.  
Cotton Selection.  
Classification of cotton.  
Varieties of cotton from different parts of the world.  
The Cotton Gin.  
Hand and Mechanical methods of mixing and distributing cotton from the bale.  
The construction of the Automatic Feeder.  
The construction of the Opener.  
The construction of the Breaker.  
The construction of the Intermediate and Finisher Lappers.  
The operation and care of Picking Machinery.  
Theory of Carding and Development of Carding Machinery.  
The Stationary Top Card.  
The Revolving Top Card.  
Principles of Roller Carding as applied to using short stock and waste.  
Card Grinding, Setting, Stripping, and care of Cards.
2. Operation of above machines.
3. Calculations connected with the machines named above.



WORSTED CARD

## Second Year.

1. Construction and use of the Railway Head.  
Principle of Drawing processes.  
Construction and care of the Drawing Frame.  
The development of the Fly Frame.  
The construction and use of the Slubbing Frame.  
The construction and use of the Intermediate Frame.  
The construction and use of the Fine Frame.  
The operation and care of the Flyer Frames.  
The construction and use of the Ring Spinning Frame.
2. Operation of above named machines.
3. Calculations connected with the above machines.

## Third Year.

- Construction and use of the Cotton Comb.  
Construction and use of the Sliver Lap Machine.  
Construction and use of the Ribbon Lap Machine.  
The operation and care of Combing Machinery.  
The construction and use of the Spinning Mule.  
The construction and use of the Spooler.  
The construction and use of the Warper.  
The construction and use of the Slasher.  
Knitting.  
Construction and operation of Web Machines, Rib Machines, Loopers, etc., in the production of plain hosiery.
2. List of machinery adapted for different purposes in Cotton Mill Work.  
Layout of machinery for different processes.

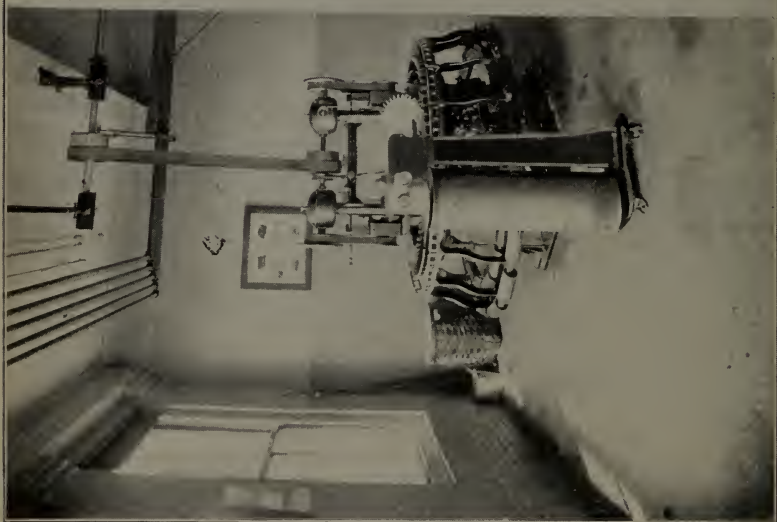
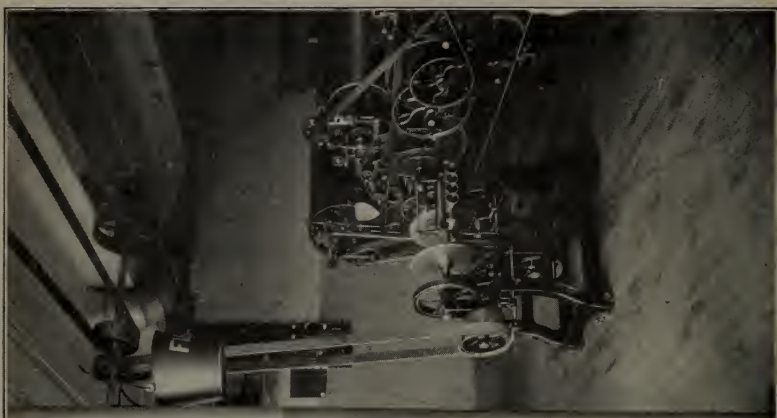
# Woolen and Worsted Spinning Department.

## WOOLEN SPINNING.

### First Year.—Second Term.

#### Lecture Course:

- Animal and Vegetable Fibres.  
Discussion of the various kinds of Wool and their Spinning qualities.  
Wool Sorting.  
Manufacture and use of Shoddies, Mungoes, Extracts, Flocks and Noils.  
Wool Washing, including the construction and uses of Washing Machines and Hydro-Extractors, and materials used as Detergents.  
Carbonization, Wet and Dry Process.  
The Solvent Process for cleansing Wool.  
Construction and uses of Dryers (Table and Artificial).  
Shrinkage of Wool in Washing.



WORSTED COMBS

Construction and uses of the several kinds of Pickers, Burring and Garnetting Machines.

Picking, Mixing, Blending and Oiling.

Kinds and quantities of Oil. Testing.

Principles of Carding.

Carding on the First Breaker, Second Breaker and Finisher.

Condensers.—Single and Double Doffers, etc.

Setting and uses of the various parts of the Card.

The various kinds of Feed.—Hand, Bramwell, Apperly,<sup>\*</sup> Camelback, Torrance Balling Head and Creel, etc.

Card Clothing,—various kinds of Backing (Leather, Linen, Flexifort, etc). Kinds and sizes of Wire; Garnett Wire.

Method of counting Card Clothing (counts and crowns).

Setting up Cards, turning up Cylinders, clothing the Card, Grinding. Speeds, Production, etc.

#### Second Year.—First Term.

Principles of Spinning.

History and development.

Hand Jack, Self-operating and Self-acting Mules.

The Mule-head.

Method of driving the various parts, Rolls, Spindles, Carriage, etc.

Backing-off.

Winding Mechanism.

Study of the Quadrant and Builder-rail.

Regulation of the Fallers.

Double Spinning.

Twisting on Mule and on Woolen Twister.

With the above lectures will be given all the necessary calculations and actual practice on the various machines.

#### WORSTED SPINNING.

#### Second Year.—Second Term.

Lecture course:

The difference between a Worsted and a Woolen Thread.

Carding.

Preparing.

What wools are Prepared and why they are not Carded.

Doubling and Back Washing,—the nature of these processes.

The principles, history and development of Combing.

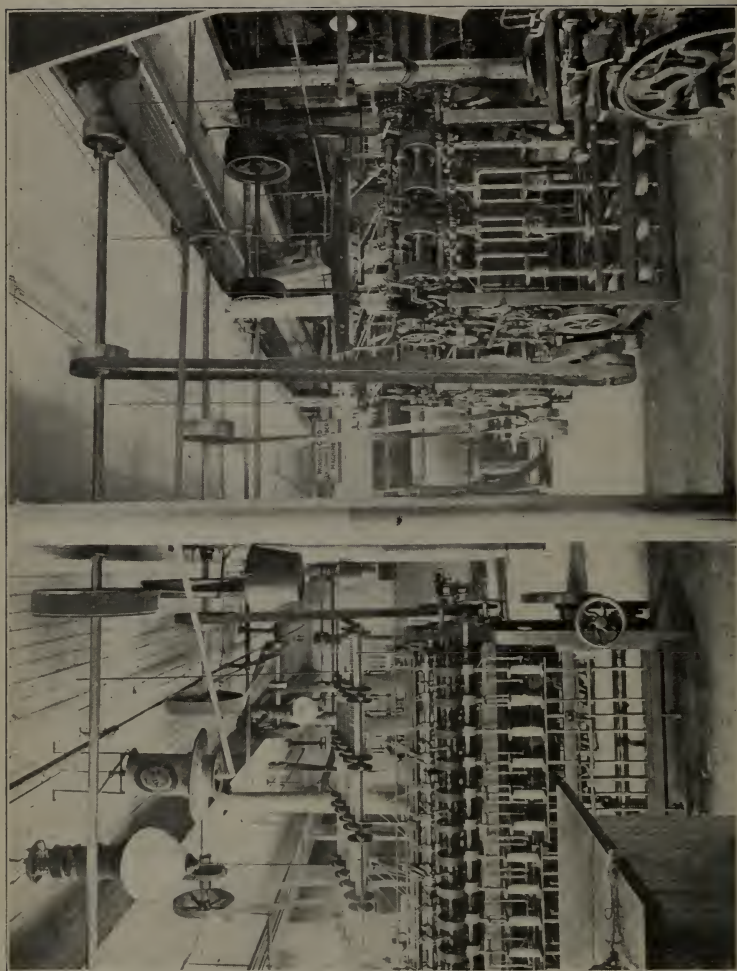
Combing on the Noble, Lister, Holden and Little & Eastwood Machines.

Pin Setting.

Gilling and Top Making.

The hygroscopic property of Wool.





WORSTED DRAWING.

Conditioning of Tops.  
Principles of Drawing.  
Construction of the Drawing and Roving Frames.  
Drawing on the Open, Cone and French Systems.  
Study of the Drag.  
Stop Motions.  
Construction and uses of Gauge Points.  
Principles of Spinning.  
Spinning on the Cap, Flyer and Ring Frames.  
Worsted Mule Spinning.  
Types of Frames (Leicester and Illingworth).  
Spinning of Carpet, Braid and Botany yarns.  
The system of counting Worsted yarns.  
Doubling and Twisting, including the construction and uses of the various kinds of Twisters.  
Winding, Hanking, Balling and Bundling.  
Yarn Testing, etc.  
The above lectures include all the necessary calculations and actual practice on the various machines.

#### Third Year.

Manufacture of fancy yarns.  
Fancy mixed yarns.  
Woolen and cotton.  
Woolen and Silk.  
Woolen and worsted.  
Union yarns, (Worsted and Cotton).  
Two, three and more ply, fancy twists.  
Fancy knotted yarns, Knickerbocker, etc.  
Loop, Slub and Mottled yarns.  
Color as applied to fancy yarns.  
Layout of machinery for different processes.  
Humidifying and Humidifiers.  
Production and Costs.

## Designing Department.

### GENERAL COURSE.

#### First Year.

1. Course of lectures on cloth construction and designing in Cotton, Woolen, Worsted, Silk, Linen, etc.  
Classifications of fabrics.  
Plain fabrics and fabrics on a plain cloth basis.  
Names and explanations of different parts of cloth and terms applied to weaves, etc. Point or design paper.





WOOLEN  
CARDS

Methods of representing weaves, drafts, etc., on paper.

Explanation of harness and chain drafts.

Twill cloth and combination of same.

Broken twills.

Sateens.

Combination of weaves.

Figured weaving on plain ground.

Diapers, coatings, trouserings.

Colored goods, stripes.

Checked goods.

2. Practical work and lessons on cloth analysis and reproduction of fabrics, one on planning patterns, drafts, etc., on paper, including yarn and cloth calculations, as below.

3. Practical work on hand looms, putting into operation the principles taught in the foregoing course.

Yarn and cloth calculations.

4. The uses of textile calculations, methods of naming or counting cotton, worsted and linen yarns.

Methods of naming woolen yarns.

Methods of naming silk yarns.

Comparative calculations for converting one system of yarns into that of another.

Calculations for folded or ply yarns.

Calculations to find weight, count or length of warp, from given data.

Calculations for reeds.

Calculations for harness, straight, centered, or pointed draft.

Calculations for harness, spaced and in combinations.

Calculations for shrinkage, or contraction.

Calculations for quantities of material to make plain and striped warps.

Calculations for quantities of material required to make plain and checked fabrics.

Calculations to find the number of ends per inch in order to use a given weight of warp, also picks per inch to use a given weight of filling.

Calculations on the proportioning of fabrics.

Practical lessons in color effects.

Combinations of colored threads.

Color definition.

Color nomenclature.

## Second Year.

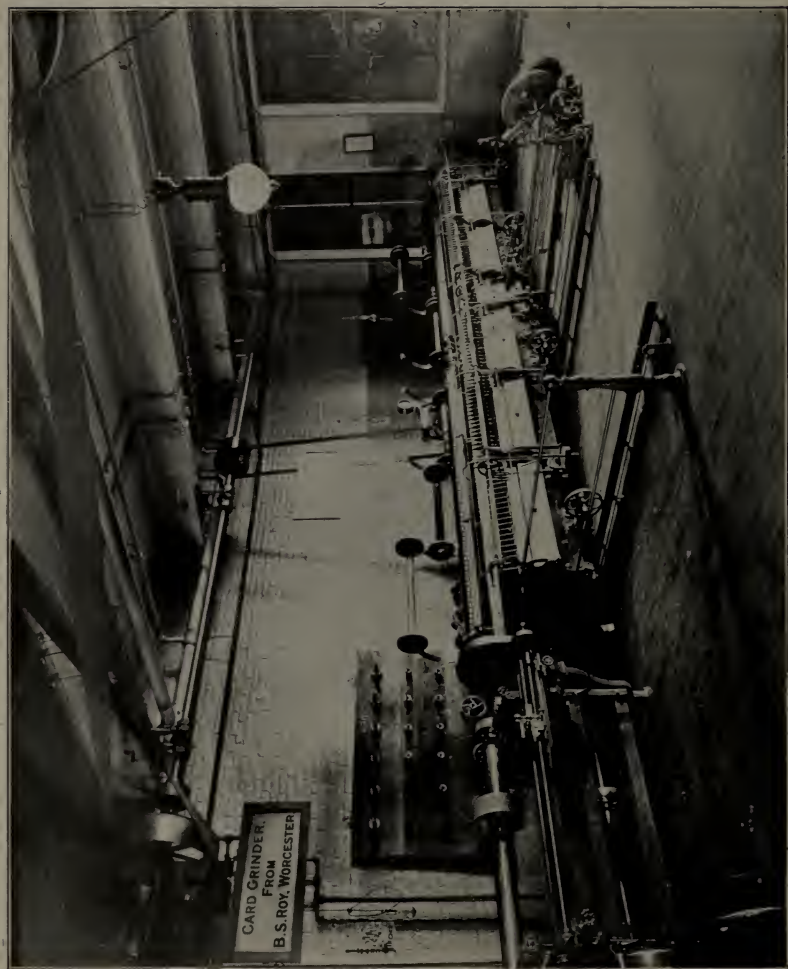
### Lecture Course:

Construction of Cloth.

Balance of Cloth.

Cloth made with or ornamented by extra warp.

Cloth made with or ornamented by extra filling.



WOOLEN MULE

- Double and Triple Cloths.
- Cotton, Fancy Sateen Stripes.
- Cotton Velvets.
- Cotton Plushes.
- Cotton Pile fabrics, cut and uncut.
- Color and color effects.
- Color definition.
- Color nomenclature.
- Fancy Woolen Cassimeres.
- Trouserings, Suitings and Coatings.
- Figured Matellasses.
- Worsted and Mohair Mantle Cloths.
- Figured Blankets.
- Carriage Robes.
- Shawls.
- Figured double plain.
- Reversibles.

Practical work and lessons on cloth analysis and reproduction of fabrics, and on planning patterns, drafts, chains, etc., on paper, including all necessary calculations.

Amount of material required for laying out lots for mixes and twisted yarns.

Amount of material used in the construction of fabrics, analysis to consist of Cotton Dress Goods, Gingham and Fancy Weave Dress Goods.

- Fancy Woolen and Worsted Cassimeres.

- Woolen and Worsted Suitings.

- Woolen and Worsted Tricots.

- Overcoatings.

- Double Cloth and Ingrain Carpets.

Practical work on hand looms, putting into operation the principles taught in the foregoing course.

### Third Year.

Lecture course :

- Cotton Gauze.

- “ Leno.

- “ Lappet.

- Jacquard Designing.

- Casting out.

- Distribution of Patterns.

- Determination of areas occupied by the figures.

- Jacquard figures formed with warp.

- Jacquard figures with filling.

- Figures not square.



DESIGN DEPARTMENT  
OFFICE



The principles of designing, cloth structure and coloring best adapted to each of the above fabrics.

Cloth formed by the combination of Jacquard gauze and fancy harness weaves.

Jacquard pile and ordinary weaves.

Special designs for Jacquard gauze, and pile fabrics.

Vestings, quiltings, lappet, gauze and fancy pile fabrics.

Analysis.

The structure and analysis of all descriptions of compound fabrics viz:—backed, double, and various types of Jacquard figured fabrics, especially applicable to the Cotton and Worsted industries.

Calculations necessary in determining the departmental and total cost of production of any fabric from given data of values of materials, labor, etc., by ascertaining the fibre, counts, threads, picks, weight, etc.

Hand and power loom practice, putting into operation the principles taught in the foregoing course.

## FINISHING.

Examination of cloth from the loom. Perching, Knotting, Baling, Mending, etc.

Preparation of cloth for the fulling mill.

Flocking and its purpose.

Construction and use of the Soaping Machine.

Use of soaps and alkalies for fulling and scouring purposes.

Construction and use of various types of Fulling Mills and Stocks.

Theory and method of fulling various classes of goods.

Construction and use of various types of Washing Machines.

Theory and method of scouring cloth before and after fulling.

Hydro Extractors and their use.

Construction and use of various types of Napping Machines.

Construction of various types of Gigs.

Theory of Crabbing.

Construction and use of various Starching and Water Proofing apparatus.

Construction and use of various types of Tentering and Drying Machines.

Construction and use of Single and Double Shears.

Construction and use of the Steam Brush.

Method of finishing various classes of woolen and worsted goods.

Cloth Examining. Measuring. Weighing. Ticketing. Numbering. Rolling. Baling. Casing and Shipping.

Construction and use of the various machines necessary for this purpose. Testing apparatus, etc.

All the necessary calculations for the various processes of finishing all classes of goods.



DESIGN DEPARTMENT



## Chemistry and Dyeing Department.

The regular course in Chemistry and Dyeing for day students extends through three entire school years, and is especially recommended to those who intend to enter any branch of textile coloring, bleaching, or the manufacture or sale of the various dyestuffs and chemicals used in the textile industry.

In addition to acquiring a thorough knowledge of the principles of all branches of dyeing, printing, bleaching, etc., the student by application, study, and conscientious performance of all the prescribed laboratory and practical work, should become efficient in the subject of Textile Chemistry, and the methods of testing the various dyestuffs, mordants, etc.

In this course the following subjects are presented.

### GENERAL CHEMISTRY.

This subject is required of all students taking the regular course in Chemistry and Dyeing and all others intending to take up the study of Textile Chemistry and Dyeing later.

It will include lectures, recitations, and a large amount of individual laboratory work upon the following subjects, and will extend through one entire school year:—

**Chemical Philosophy.**—Chemical action, chemical combination, combining weights, atomic weights, chemical equations, acids, bases, salts, Avogadro's law, molecular weights, formulas, valence, periodic law, etc.

**Non-Metallic Elements.**—Study of their occurrence, properties, preparation, chemical compounds, etc.

**Metallic Elements.**—Study of their occurrence, properties, metallurgy, chemical compounds, etc.

**The Hydrocarbons and their Derivatives.**—Study of their occurrence, properties, preparation, uses, etc.

**Qualitative Analysis.**—Before the completion of the course, the students will take up, as thoroughly as the time will permit, the qualitative detection of the more common metals and non-metals, with practical work.

No pains will be spared in giving the student a thorough training in fundamental principles of the science.

The course will consist of sixty hours of lectures and recitations, and one hundred and twenty hours of laboratory work, but those taking Course IV will take more than double this amount of work.

### QUALITATIVE ANALYSIS.

Qualitative analysis will be studied by the students taking the regular Chemistry and Dyeing course during the second term of the first year.

The subject is taught in a thorough manner, and in addition to lectures and recitations, at least fifteen hours per week of laboratory work will be required, and before completing the course, in addition to a large amount



DESIGN  
CLASS ROOM

of preliminary laboratory work, each student must satisfactorily analyze at least 30 solutions and 10 solids containing any of the common metals and acids, and six alloys containing any of the common metals. At the close of the course, each student will be required to pass a written examination upon the subject as well as a practical examination involving the analysis of a solution and a solid, each of which will contain at least ten of the common metals and acids.

### STOICHIOMETRY.

This subject will be taken up by the chemistry and dyeing students during the second term of the first year. Special attention will be paid to the writing of the chemical equations, representing the chemical reactions involved in the qualitative analysis. The application of the metric system will be carefully studied; as well as the different thermometric and specific gravity scales; and problems will be worked by the students involving the expansion and contraction of glass, determination of percentage composition of chemical compounds, etc.

### TEXTILE CHEMISTRY AND DYEING.

Under this head is included first the lecture course in Textile Chemistry and Dyeing, which is taken by all regular diploma students, and second the laboratory and practical work course which will be taken by the regular Chemistry and Dyeing or Course IV students.

#### OUTLINE OF LECTURE COURSE.

**Technology of Vegetable Fibers.**—Cotton, linen, jute, hemp, China grass, etc. Chemical and physical properties, chemical composition, microscopical study, action of chemicals, acids, alkalies, heat, etc.

**Technology of Animal Fibres.**—Wool, silk, etc. Chemical and physical properties, chemical composition, microscopical study, action of chemicals, acids, alkalies, heat, etc.

**Operations Preliminary to Dyeing.**—Bleaching of cotton and linen, wool scouring, bleaching, fulling and felting, silk scouring and bleaching, action of soaps.

**Water and its Application in the Textile Industry.**—Impurities present, the methods of their detection, their effect during different operations, and methods for their removal or correction.

**Mordants and other Chemical Compounds used in textile coloring not classified as dyestuffs.**—Theory of mordants, their chemical properties and their application, aluminium mordants, iron mordants, tin mordants, chromium mordants, organic mordants, tannin materials, sulphated oil, fixing agents, leveling agents, assistants, etc.

**Theory of Dyeing.**—Chemical, mechanical, solution, etc.

**Natural Coloring Matters.**—Origin, properties, application of indigo, logwood, catechu or cutch, Brazil wood, cochineal, fustic, tumeric, madder, quercitron bark, Persian berries, etc.



DESIGN DEPARTMENT  
CLASS ROOM

**Artificial Coloring Matters.**—General discussion of their history, nature, source, methods of manufacture, and methods of classification.

Special study of:—

Direct Cotton Colors.

Basic Coloring Matters.

Acid Dyestuffs.

Phthalic Anhydride Colors, including the eosins, rhodamines, phloxines, etc.

Alizarine Colors, including other artificial coloring matters requiring a metallic mordant.

Insoluble Azo Colors, developed on the fibre.

Aniline Black, artificial indigo, and other artificial dyestuffs not coming under the above heads.

**Machinery used in Dyeing.**—A certain amount of time will be devoted to the description of the machinery used in the various processes of textile coloring and this will be supplemented as far as possible by the use of charts, diagrams, lantern slides, etc.

#### OUTLINE OF LABORATORY AND PRACTICAL WORK.

Besides lectures and recitations upon this subject, those taking the regular day course in Chemistry and Dyeing will be required to do at least fifteen hours per week of practical laboratory work. By the performance of careful and systematic experiments the student will learn the nature of the various dyestuffs and mordants, their coloring properties, their action under various circumstances and the conditions under which they give the best results. The more representative dyestuffs of each class will be applied to cotton, wool and silk, and each student will be obliged to enter in an especially arranged sample book, a specimen of each of his dye trials with full particulars as to conditions of experiment, percentage of compounds used, time, temperature of dye bath, etc.

For convenience and economy, most of the dye trials will be made upon small skeins or swatches of the required material, but from time to time students will be required to dye larger quantities.

By the use of a small printing machine the principles of calico printing, and with the introduction of small dyeing machines, vats, etc., the practical side of the subject will be studied, and it will be the constant endeavor of those in charge, to impart such information of a theoretical and scientific character as is usually difficult to obtain in a dyehouse.

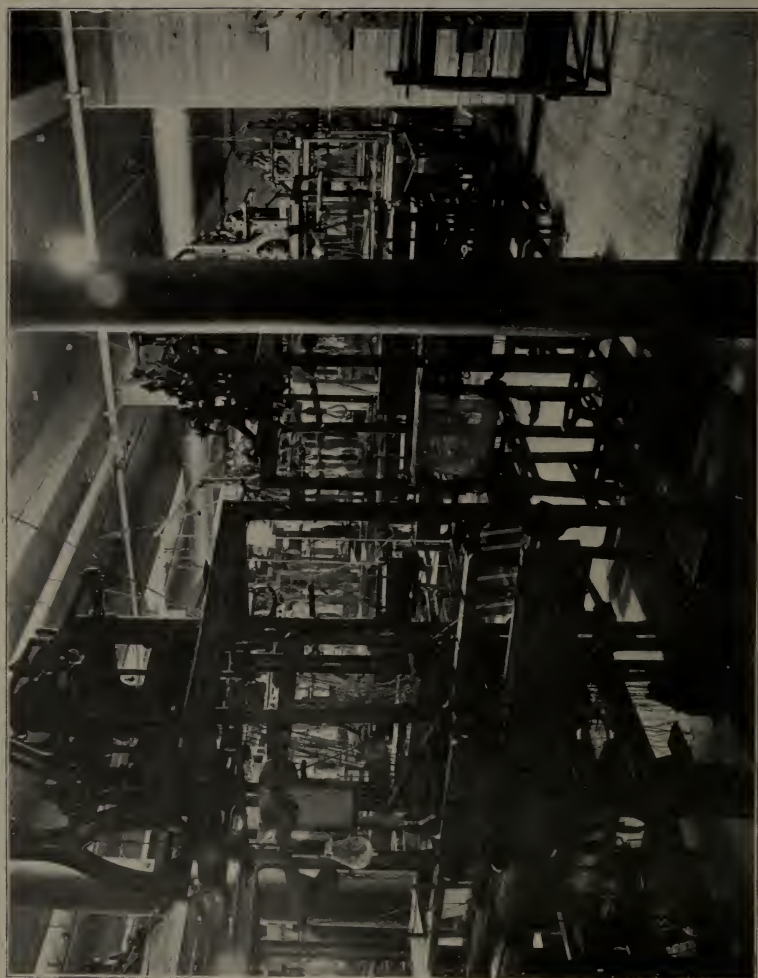
#### CHEMICAL PHILOSOPHY.

This will be a continuation of the Stoichiometry of the first year.

It will include a general consideration of matter, the principles of hydrostatics, including the laws of specific gravity, and pneumatics, calorimetry, specific heat, vapor density, the important laws of solution, and the various methods of determining molecular weights.

The student will be required to deduce formulae, and work out a large number of problems introduced by the subject.





HAND LOOMS

## ADVANCED INORGANIC CHEMISTRY.

The whole subject of inorganic chemistry will be reviewed during the second year, and many advanced topics will be introduced which were necessarily omitted from the first year course in General Chemistry.

### ORGANIC CHEMISTRY.

This subject, which was introduced during the latter part of first year general chemistry, will be continued during the whole of the second year as a special subject. The study will be taken up in a thorough manner and by the end of the year the student will understand the composition of the important artificial dyestuffs and the equations representing the reactions involved in their manufacture.

It will include lectures, recitations and laboratory work.

### INDUSTRIAL CHEMISTRY.

This subject will be taken up during the third year, particular attention being paid to those branches which are of special interest to the textile chemist, as oils, soaps, the gas and coal tar industry, building materials, and the manufacture of the important chemical compounds, acids, alkalies, bleaching powder, various mordants, etc., on a large scale.

The course will be illustrated as far as possible with experiments, specimens, diagrams, and charts, and the students will be given an opportunity to visit some of the industrial establishments in the vicinity of Lowell and Boston.

## ADVANCED TEXTILE CHEMISTRY AND DYEING.

This will be a continuation of the Textile Chemistry and Dyeing of the second year, and will include a review of the second year's work, with the introduction of many advanced subjects; such as dye testing, calico printing, comparative dye trials, and numerous problems that arise in the dye house.

The course will include a large amount of work in the dyeing, laboratory and will be supplemented by trips to a number of the large dye houses and print works in the vicinity.

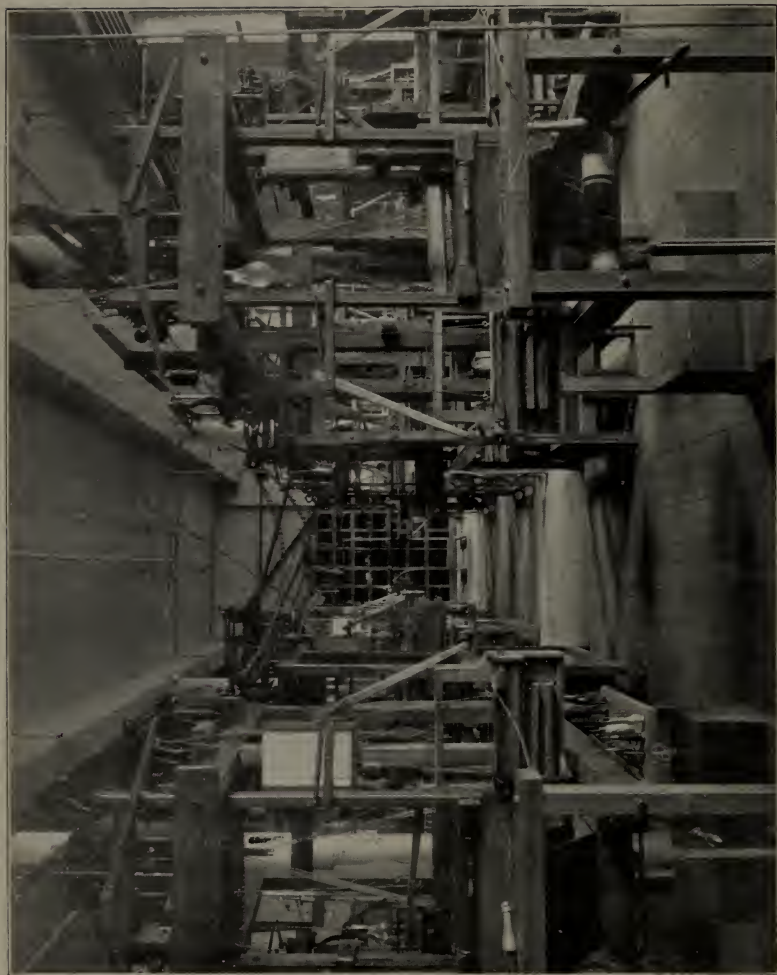
### QUANTITATIVE ANALYSIS.

This subject is taken by all regular Chemistry and Dyeing students, and extends through the second and third years of the course.

**The Second Year Work** consists of a thorough training in the general principles of analytical work, the ground covered being practically that found in "Talbot's Quantitative Analysis." Each student is assigned a desk in the laboratory for his sole use, and is required to perform a large number of analyses independently.

**The Third Year Work** is designed to give the student sufficient experience to allow him to deal intelligently with technical problems. The laboratory work will consist of the analysis of such substances as lubricating oils, alkalies, soaps, coal, water, bleaching powder, lime, etc.





HAND LOOMS

## MICROSCOPY.

The students in this course will be given a certain amount of microscopy. The work will include instruction in the use of the microscope, examination and detection of various fibres, and the preparation of slides.

## THESIS.

Upon completion of this course, each student is required to present a thesis and do a certain amount of original work on some subject appropriate to this department. When this thesis has been accepted by the head of the department, and examinations successfully passed in all required subjects, the student will be entitled to the regular school diploma.

## Weaving Department.

### First Year.

1. The process of making pattern warps.

The construction and use of Spooling and Quilling Machinery for wool and cotton.

The construction and use of Warpers of various kinds.

The Woolen Sizing Machine.

The Woolen Beamer.

Sizing materials and size mixing machinery.

Long and short chain systems of preparing warps and filling.

Drawing-in and twisting.

Operation of machines named above, and warp preparation in cotton, woolen and worsted, silk and linen, timed to correspond with the respective lectures.

### Second Year.

1. The plain power loom and its construction.

Shedding by cams.

Various pickers and picking motions.

Fast and loose reeds.

Take up and let off motions.

Minor adjustments of the power loom.

Plain looms as altered for weaving fancy cloth.

Looms constructed for several shuttles.

Drop box motions.

Shedding motions.

Single acting dobbies.

Double acting dobbies.

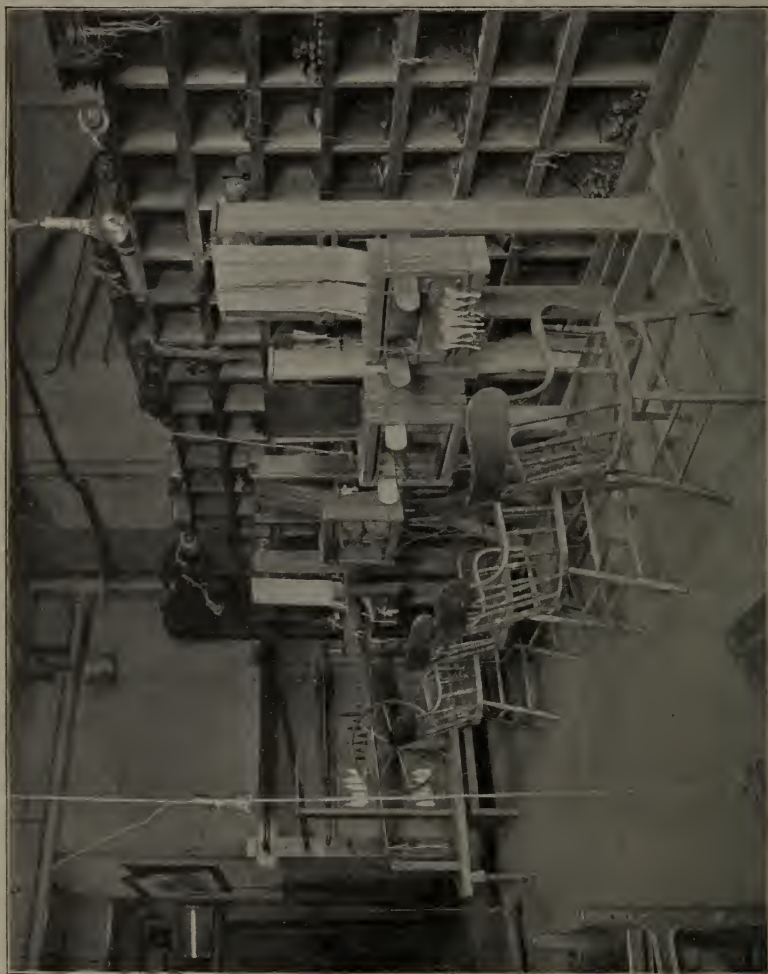
Spring boxes and other motions for returning harness.

Chain building for dobbies.

Chain building for box looms.

Various handkerchief motions.

Lappet motions.



DRAWING IN  
FRAMES

Towel and other pile cloth weaving.

Open and close shed looms.

2. Practical work on the above looms, including teaching the student to weave, and fix looms.

Also pulling down looms and rebuilding same, including timing and setting.

This work will be arranged to correspond with the respective lectures.

3. Lessons on calculations applied to the machines and processes named above.

### Third Year.

1. Lectures on Jacquard machinery.

Gauze and Leno weaving.

Single lift Jacquards.

Double lift Jacquards.

Leno Jacquards.

Jacquards specially arranged for ingrain carpet work.

Tapestry weaving, quilt weaving and so on.

Weave room engineering and equipment.

Cost of weave mill operation and statistics of operations.

## Department of Mechanics.

### First Year.

Elements of Mechanism.

Force and Work, Measurement of  
Screw.

Worm and Wheel.

Pulley Blocks.

Inclined Plane and Wedge.

Rolling Cylinders and Cones.

Gearing, Spur and Friction.

Flexible Connectors.

Belts.

Cords.

Chains.

Levers.

Theory and Design.

Cams.

Wipers.

Toggle Joints.

Quick Return Motions.

Harmonic Motion.

Wheels in Trains.

Mangle Wheels.

Aggregate Combinations.

Differential Pulleys.

Epicyclic Train, Compounds.

Disc and Roller.

Elements of Thermodynamics as applied to steam.

Motive Powers :

Steam.

Water.

Gas.

Electricity.

Turbines, in-flow, out-flow, upward and mixed.

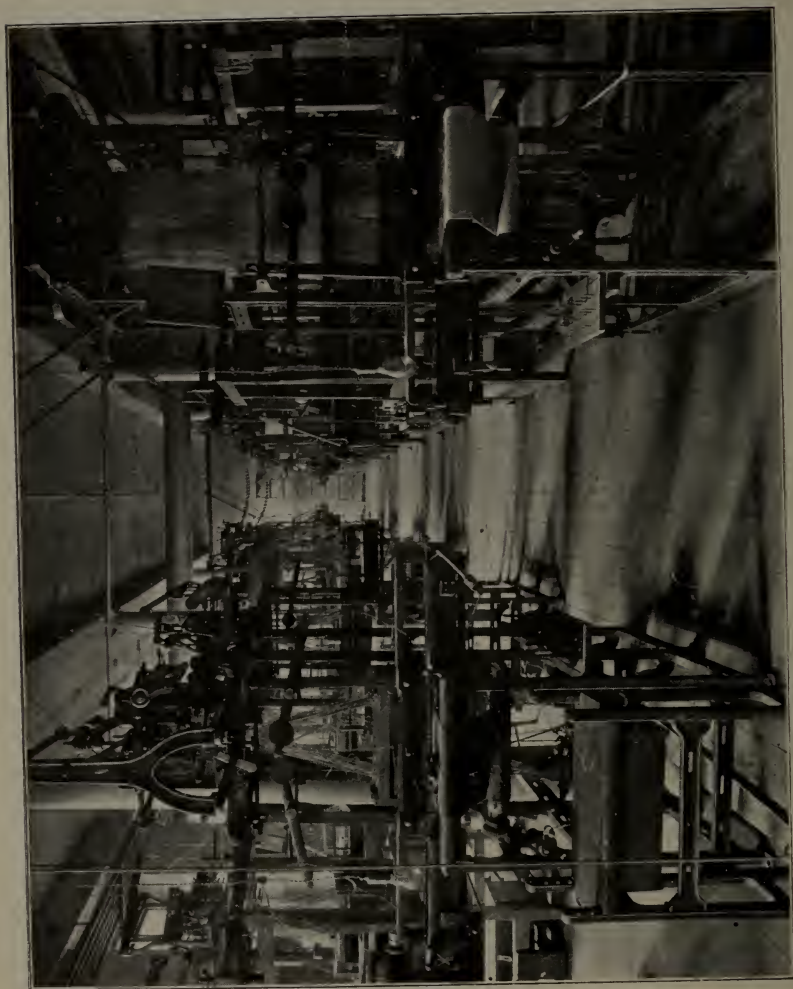
Suction and draft tubes.

Flow of water, quantity and power.

Dynamometers.

Measurement of power.

Pressure and impulse wheels.



HAND LOOMS



- |   |                            |
|---|----------------------------|
| Water Meters.   | Governors.                 |
| Steam engine.   |                            |
| Simple, compound and triple expansion.                            |                            |
| Slide Valve Gear :  |                            |
| Double ported, Corliss and Cam.                                   |                            |
| Condensing engines.   |                            |
| Coal consumption.   |                            |
| Use of exhaust steam for heating and dye-house purposes.          |                            |
| Indicator :   |                            |
| Construction of and use in measuring power and setting valves.    |                            |
| Practical use of indicator and computation of indicator diagrams. |                            |
| Governors, throttling and cut-off.                                |                            |
| Economy and Costs.  |                            |
| Electric current :  |                            |
| Ohm, ampere, volt and watt.                                       |                            |
| Ohm's law.  |                            |
| Law of Lenz.  |                            |
| Direct and alternating currents.                                  |                            |
| Magnetism.  |                            |
| Induction.  |                            |
| Simple, series, shunt, and compound windings.                     |                            |
| Transformers.   |                            |
| Adaptability of current to mill purposes, light, power and heat.  |                            |
| Transmission.   |                            |
| Economy.  |                            |
| Gas engine theory :   |                            |
| Throttling type.  | Hit and miss type.         |
| Heat units in gas.  | Governing devices.         |
| Mechanical Drawing :  |                            |
| Care and use of instruments.                                      | Geometrical Constructions. |
| Elements of Projections.  | Isometric Drawings.        |
| Perspective Drawing.  | Working Drawings.          |
|   | Blue Print Process.        |

## Second Year.

- Applied Mechanics.
- Strength of Materials.

In the above topics will be included as many problems as possible, dealing with the construction of and maintenance of mills, not with the purpose of educating mill engineers, but rather to familiarize the student with the means at hand and processes employed in erecting structures for manufacturing, that they may study their government more advantageously.





CHEMISTRY DEPARTMENT  
OFFICE

### Machine Drawing.

Practical sketching from machines, both for mechanism construction and detail and assembly drawing.

### Third Year.

Mill Construction.

“ Humidifying.

“ Maintenance.

Mill Ventilation.

“ Warming.

“ Fire Protection.

Several courses of lectures on allied subjects by outside lecturers will be added.

## Decorative Art Department.

The close relation Decorative Art bears to the textile industry requires the organization of a Decorative Art Department.

While it is the special object of the School to give instruction in this department of such a character as to develop a knowledge of the laws of decoration and theory of design as applied to textile fabrics of every kind, it is also true that the fundamental instruction necessary for this is similar to that required for other branches of decorative art, so that students who do not intend to follow textile manufacturing are invited to join these classes.

Special arrangements have been made to form classes in freehand drawing and decoration, for the purpose of giving the students general instruction in the theory and practice of decorative art, the instruction afterwards to be devoted to the special branch the student desires to follow. The school will thus fulfill the object of preparing the student in practical designing in any of the branches of decorative art, with special regard to fabrics.

### Decoration.

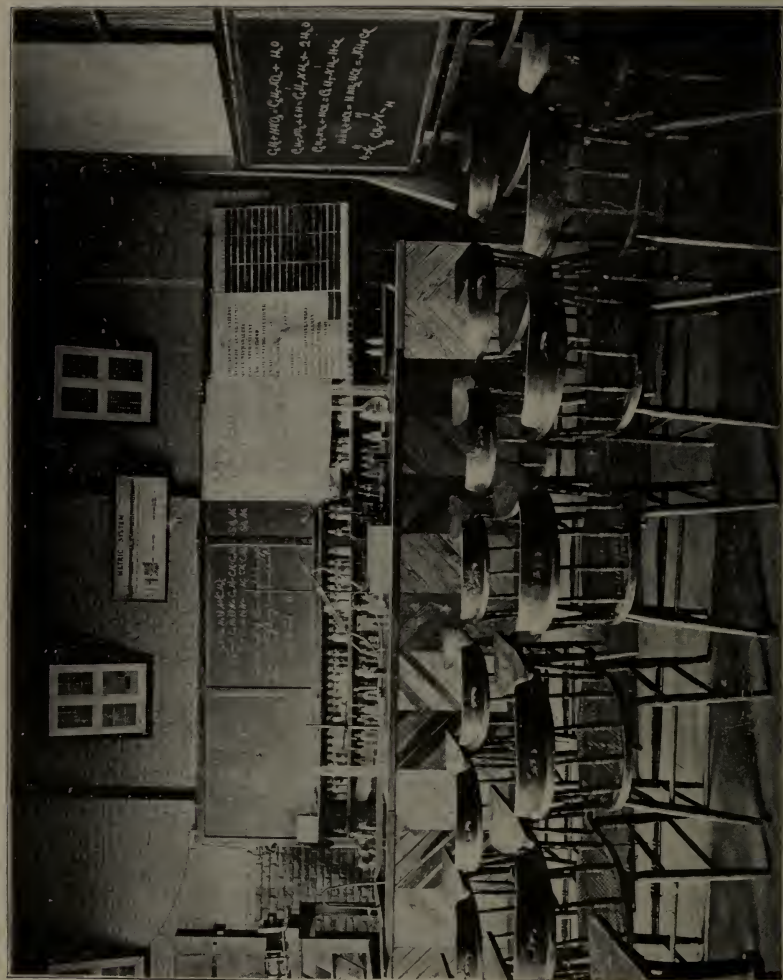
The class in decoration and design is for the purpose of teaching the principles that enter into every species of design and while it is intended especially for fabrics, jacquard, damasks, carpets, table-cloths, etc., it is equally applicable to any branch of Decorative Art, and would include the designing of wall paper, book covers, silver, interior decoration, etc.

The fee for the course will be \$15.00 per term.

### Class in Drawing, Painting, and Composition.

This class will be for the benefit of those wishing to become painters, decorators or illustrators.

In this class drawing, painting and composition will be taught, and later, should the size of the class warrant it, drawing from the model will be introduced.



CHEMISTRY  
LECTURE ROOM

This class will be modelled after the Julian Academy of Paris.

Professor George's long experience abroad and in years of teaching in Boston makes this an exceptional opportunity for the students wishing to avail themselves of it.

In the new building now erecting studios are planned for this purpose.

The classes will be in session Tuesdays and Thursdays from 9 to 12 and 2 to 4, and Saturday from 9 to 12.

## Stenography and Typewriting.

As an incidental study in the Commercial Course, arrangements have been made for instruction in Stenography and Typewriting. In many cases where there is a demand from selling houses for clerks who are familiar with the more technical portions of the business, a greater facility for handling the work will be had, if the clerk is familiar with the above named branches. The course is optional, and a fee will, for the present be charged, depending upon the length of the course taken.

## Languages.

A department of modern languages has been established at the School; students at the school are offered either of these courses at a charge of \$5 for 20 lessons.

Others who may desire to avail themselves of these language courses, without taking other courses, may do so at a charge of \$8 for 20 lessons.

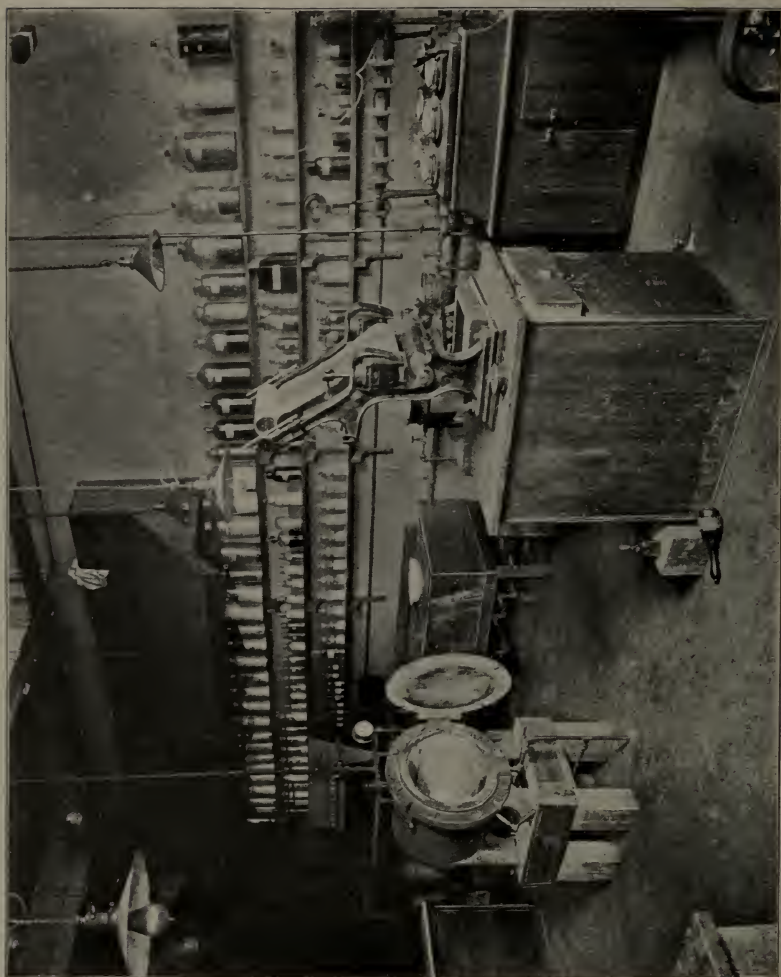
In general the classes will meet after four o'clock in the afternoon.

Announcement of the classes, and further information may be had by addressing the Principal.

## General Lectures.

Lectures on the various branches and specialties of the textile business will be given from time to time. Among the subjects will be Patent Law; Fire Protection; Mill Costs; Finishing; Power, Heat and Light. The course for 1901-1902 is not yet completed, but the course as given during 1900-1901 was as follows:—





PRINTING MACHINE AND  
STEAMING BOX

## GENERAL LECTURE COURSE.

1900--1901.

### LIST OF SPEAKERS AND THE SUBJECTS.

- JOHN H. BURGHARDT, of Boston, Mass.—Leather Belting.  
SALMON W. DAVIS, of Providence, R. I.—General Information on Oils.  
SIDNEY B. PAINE, of Boston, Mass.—Electric Driving in Textile Mills.  
E. V. FRENCH, of Boston, Mass.—Fire Protection in Mills.  
EDWARD M. WELD, of Boston, Mass.—Cotton.  
H. G. KITTEDGE, of Boston, Mass.—Cultivation of Cotton.  
W. W. CROSBY, of Lowell, Mass.—Common uses of Steam.  
ARTHUR T. STAFFORD, of Lowell, Mass., Water Power.  
FRANK B. COMINS, of Boston, Mass.—Humidity in Cotton Mills.  
ARTHUR S. WATTLES, of Canton, Mass.—Sizing Compounds and their Effect.  
E. W. THOMAS, of Lowell, Mass.—Method of Cost Finding in Mills.  
Also,  
PROF. CHANNING WHITAKER, S. B.—Patent Law.  
HERBERT N. DAWES, S. B.—Economy in Steam Plants.

### EVENING CLASSES.

The courses of instruction offered in the evening are identical with those of the day, with the exception that less time is devoted to the machine work, since, in most cases this is of small moment; ordinarily the handling of the machinery is a part familiar to most of the students through contact with it in the day time, and in such cases the explanations and calculations are of the greater importance. In some cases it is possible to pursue two courses together, but this depends always on the arrangement of the schedule for any particular year.





CHEMICAL LABORATORY

The evening courses are free to graduates of the Evening High and Drawing Schools, operatives of the mills and machine shops, and other residents of Lowell, to such numbers as may be accommodated in the various classes. Applications will be considered in the order in which they are received.

The requirements for admission to the Evening Classes are similar to those for the Day. Graduates of other schools, will be received on presentation of proper credentials; for all others, examinations will be held on Thursday, Sept. 26, at 7 P. M. at the School. The candidates must be familiar with the English language, and the principles of arithmetic; for the first part, a short composition must be written on a given theme, and a certain amount must be written from dictation, while in the latter will be included addition, decimals, fractions, percentage, ratio and proportion.

### **Subjects.**

The list of subjects embraced in each course is identical with that of the day and may be found beginning at page 41.

### **Certificate.**

With the honorable and satisfactory completion of either of the regular evening courses in any subject, the certificate of the School will be awarded.

#### **Course I, Cotton Spinning.—3 Years.**

Fee for all except residents of Lowell, \$2.50 per term. \$5.00 per year. See page 41.

#### **Course II [A], Woolen Spinning.—1 Year.**

#### **Course II [B], Worsted Spinning.—2 Years.**

Fee for all except residents of Lowell, \$2.50 per term, \$5.00 per year. See page 43.

#### **Course III, Designing.—3 Years.**

Fee for all except residents of Lowell, \$5.00 per term, \$10.00 per year. See page 47.



CHEMICAL LABORATORY

#### **Course IV, Chemistry and Dyeing.—3 Years.**

Fee for all except residents of Lowell, \$5.00 per term, \$10.00 per year. A deposit of \$5 will be required from all who take this course, whether residents of Lowell, or not, to cover the cost of the laboratory breakages ; at the end of the year any unexpended balance will be returned, or an extra charge made, as the case may be. See page 55.

#### **Course V [A], Warp Preparation.—1 Term.**

Fee for all except residents of Lowell, \$2.50. See page 63.

#### **Course V [B], Weaving.—2 Years.**

Fee for all except residents of Lowell, \$2.50 per term, \$5.00 per year.

NOTE:—To secure the diploma of the School in Course V, both A and B must be completed. Course V [A] may be taken with Course V [B], so that the whole may be completed in two years. See page 63.

#### **Course VI, Mechanical Engineering.—2 Years.**

Fee \$2.50 per term. Free to residents of Lowell. See page 65.

#### **General.**

The schedule showing the arrangements of classes for each term will be announced at the opening of each term.



DYEING LABORATORY



REFERENCE No.	YEAR	TERM	HOURS PER WEEK	PREPARA- TION	METHOD OF INSTRUCTION	INSTRUCTOR IN CHARGE	TAKEN BY
Arithmetic	1	Entrance					
English	2	"					
Geography	3	"					
Algebra	4	1	2	1	Lecture Recitation	Barker Perkins	All regular
Geometry	4	(Given in connection with No. 12 for the present.)					
Elements Mechanism	10	1	3	4	Lecture Recitation	Crosby Perkins	All regular
F. H. Drawing	11	1	2	1, 2	Lecture Recitation	George Crosby	All regular
Mechanical Drawing	12	1	6	1, 2	Lecture Recitation Lab.	Perkins Crosby	All regular
Applied Mechanics	13	2	2	10, 12	Lecture	Crosby Perkins	I, II, III & V
Machine Drawing	14	2	4	11, 12	Lab.	Crosby Perkins	All regular
Mechanism Drawing	15	2	2	11, 12	Lab.	Perkins	All regular
Mill Engineering	16	3	1	13	Lecture	Crosby	All regular
Design Construction	25	1 } 1 }	2	1, 2	Lecture Recitation	Umpleby Barr	I, II, III & V
Cloth Construction	27	1	2	1, 2	Lecture Recitation	Umpleby Barr	"
Hand Looms	28	1	2	1, 2	Lab.	Umpleby Barr	"
Design Construction	29	2 } 2 }	2	25, 26	Lecture Recitation	Umpleby Barr	"
Cloth Construction	30						



REFERENCE No.	YEAR	TERM	HOURS PER WEEK	PREPARA- TION	METHOD OF INSTRUCTION	INSTRUCTOR IN CHARGE	TAKEN BY
Cloth Analysis	31	2	1 & 2	2	27	Umpleby Barr	I, II, III & V
Hand Looms	32	2	1 & 2	2	26, 28	Umpleby	"
Design Construction	33	3 }	1 & 2	2	29, 30	Pradel	"
Cloth Construction	34	3 }				Umpleby Barr	"
Cloth Analysis	35	3	1 & 2	2	31	Umpleby Barr	"
Hand Looms	36	3	1 & 2	2	30, 32	Umpleby Pradel	"
Design Construction	37	A course similar to 25-36 given in the afternoon for students tak- ing Decorative Art.					
Cloth Construction	38						
Cloth Analysis	39						
Hand Looms	40						
General Chemistry	50	1	1 & 2	3	2-4	Olney	All regular
General Chemistry	51	1	1 & 2	6	2-4	{ Olney Spencer French }	" "
Qualitative Analysis	52	1	2	8	50-51	{ Spencer French }	IV
Stoichiometry	53	1	2	1	50-51	Spencer	IV
Advanced Inorganic	54	2	1 & 2	1	52-53	Spencer	IV
Chem. Philosophy	55	2	1 & 2	1	52-53	Spencer	IV
Organic Chemistry	56	2	1 & 2	2	54-55	Olney	IV
Tex. Chemistry & Dyeing	57	2	1 & 2	3	50-51	Olney	All regular

REFERENCE No.	YEAR	TERM	HOURS PER WEEK	PREFARA- TION	METHOD OF INSTRUCTION	INSTRUCTOR IN CHARGE	TAKEN BY
Tex. Chemistry & Dyeing	58	2	1 & 2	16	37-50-51	Lab, Olney	IV
Quantitative Analysis	59	2	1 & 2	2	56	Moorehouse French	IV
"	60	2	1 & 2	10	59	French Lab.	IV
Industrial Chem.	61	2	1	10	56	Olney Lab.	IV
Tex. Chemistry & Dyeing	62	3	1 & 2	15	57-58	Spencer Olney	IV
"	63	3	1 & 2	1	57-58	Moorehouse Olney	IV
Industrial Chem.	64	3	1 & 2	1	61	Olney Lecture	IV
Quantitative Analysis	65	3	1 & 2	2	59-60	French Lecture	IV
"	66	3	1 & 2	16	59-60	French Lab.	IV
Microscopy	67	3	1 & 2	2	57-58	Olney Lab.	IV
Cotton Fibre	75	1	2	2	10-11-12	French Humphrey	I
" Preparing & Carding	76	1	2	4	75-10-11-12	Humphrey Lab.	I
" Drawing	77	2	1	4	75-76	Smith Humphrey	I
"	78	2	1	6	77	Humphrey Lab.	I
" Ring Spinning	79	2	2	5	78	Smith Humphrey	I
"	80	2	2	6	79	Humphrey Lab.	I
"	81	3	1	4	80	Smith Humphrey	I
" Combing	82	3	1	9	81	Humphrey Lab.	I

REFERENCE No.	YEAR	TERM	HOURS PER WEEK	PREPARA- TION	METHOD OF INSTRUCTION	INSTRUCTOR IN CHARGE	TAKEN BY
Cotton Mule Spinning 83	3	2	4	82	Lecture	Humphrey	I
" Spooling, Warping etc. 84	3	2	9	83	Lab.	Humphrey Clark, Smith	I
Wool Fibre 90	1	2	6, 5	10-11-12	Lecture	Barker	II
Woolen Carding 91	1	2	6, 10	90	Recitation Lab.	Stewart Barker	II
Woolen Spinning 92	2	1	11	91	Lecture	Stewart Barker	II
Worsted Carding 93	2	2	11, 5	90	Lab.	Stewart Barker	II
Combing & Top Making 94	2	2	11, 10	93	Lecture	Stewart Barker	II
Worsted Drawing 95	3	1 & 2	15	94	Lab.	Stewart	II
Spinning & Twisting 96	3	1 & 2	1	{ 33, 34, 50, 51, 92, 95, 96, 108	Lecture	Stewart	II, III
Finishing 97					Lab.	Stewart	
Plain Loom Constr'n 105	2	1	4	10-11-12	Lecture	W. Nelson	All regular
Weaving 106	2	2	7	25-26 27-28	Lab.	T. Nelson	"
Weaving 107	3	1	11	106	Lecture	W. Nelson	"
Weaving 108	3	2	11	107	Lab.	T. Nelson	I, II, III, V
					Lecture	W. Nelson	I, II, III, V
					Lab.	T. Nelson	

REFERENCE No.	YEAR	TERM	HOURS PER WEEK	PREPARA- TION	METHOD OF INSTRUCTION	INSTRUCTOR IN CHARGE	TAKEN BY
Weaving Mechanism	109	2	1 & 2	11	105	W. Nelson	V
"	110	3	1 & 2		109	T. Nelson W. Nelson	V
F. H. Drawing	120	1	1 & 2	2	1, 2	T. Nelson George	Special Art
Historic Ornament & Design Color	121	1	1	10	Lecture	George	All regular
Drawing	122	1 & 2					
Painting	123	1 & 2	1 & 2	13	Lab	George	Special Art
Illustrating	124	1 & 2					
Decoration	125						
& Design	126	3	1 & 2	13	Lecture	George	Special Art
Historic Ornament	127			122			
Color	128	1	2	125	Lab.	George	Special Art 125-126-127



PLAIN LOOM

## REGISTER OF DAY STUDENTS.

### Third Year.

	COURSE.	
BUCHAN, D. C.	II	Andover, Mass.
EWER, N. T., Ph. B.	IV	Lowell, Mass.
FOSTER, C. E.	II	" "
HASKELL, W. F.—A. B.	IV	" "
KINGSBURY, P. F.	IV	" "
MARINEL, W. N.	I	No. Chelmsford, Mass.
MOOREHOUSE, W. R.	IV	Lowell, Mass.
PARKER, B. M.	I	" "
WEBBER, A. H.	IV	Beverly, Mass.
WISE, P. T.	II	Malden, Mass.

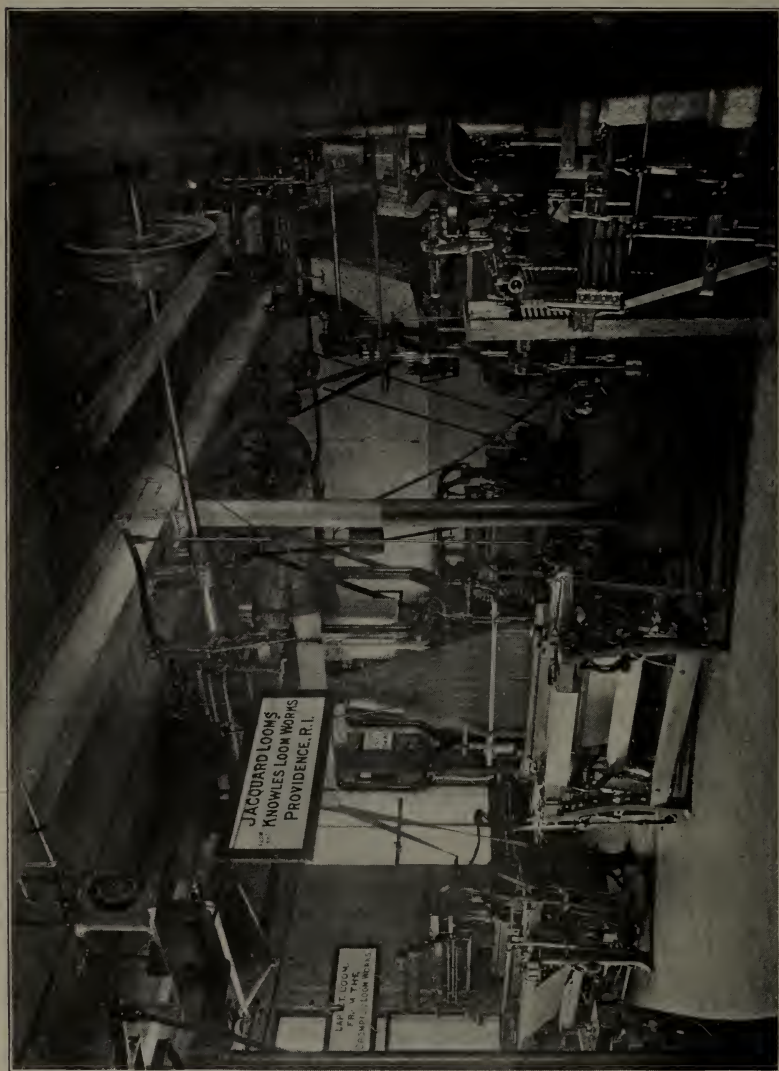
### Second Year.

BARR, I. W.	II	Lowell, Mass.
BENNETT, E. H.	III	Saugus, Mass.
CARTER, R. A.	IV	Reading, Mass.
CRAIG, C. E.	III	Lowell, Mass.
CURRAN, C. E.	II	Lawrence, Mass.
CURRIER, J. A.	II	No. Andover, Mass.
FERGUSON, A. F.	I	Roxbury, Mass.
LINCOLN, H. A.	I	Brookline, Mass.
MINGE, J. C.	I	Faunsdale, Ala.
NAJARIAN, G.	IV	Rowley, Mass.
OTSUKA, W.	V	Inabe Ise, Japan
STRATTON, W. E.	III	Boston, Mass.
SWIFT, E. S.	I	Lowell, Mass.
TAYLOR, C. S.	II	Worcester, Mass.
TOTOKI, H.	V	Tokio, Japan
WOODMAN, H. L.	I	Lowell, Mass.
YOUNGMAN, G. M.	II	Lowell, Mass.

### First Year.

ARNOLD, W. B.	I	Ashmont, Mass.
BLOOM, W. N.	IV	Medford, Mass.
BRADLEY, R. H.	V	Lowell, Mass.
BULLOCK, E. J. C.	I	Warren, R. I.
BUSH, T. G., Jr.	I	Birmingham, Ala.
BUSH, M. W.	I	" "
CAMPBELL, O. S.	II	Ware, Mass.
CHAMBERLAIN, F. E.	I	Jamaica Plain, Mass.
EMERSON, F. W.	II	Lawrence, Mass.
EYERS, J. T.	IV	Lowell, Mass.
FULLER, G.	I	Adams, Mass.
GANT, J. E.	I	Burlington, N. C.





JACQUARD LOOMS

GOOCH, A. N.	II	Wakefield, Mass.
GOOCH, A. L.	II	" "
HANLEY, A. M.	III	Worcester, Mass.
HARRIMAN, J. P.	I	Ashmont, Mass.
HARRIS, G. S.	I	Rome, Ga.
JACQUES, E. W.	III	Lowell, Mass.
McKENZIE, B. D.	IV	Carlton Hill, N. J.
MONK, R. E.	IV	Sharon, Mass.
McBRIDE, W. F.	II	Lowell, Mass.
McMULLAN, L. L.	I	Hartwell, Ga.
MYRICK, H. W.	V	Concord, Mass.
O'HARA, W. F.	IV	Chelmsford, Mass.
OXLEY, W.	II	Oxford, N. S.
PRATT, A. S.	I	Lewiston, Me.
RAMSDELL, T. E.—B. S.	III	Housatonic, Mass.
RASCHE, W. A.	I	New York
RICKS, D. A.	I	Rocky Mt., N. C.
RICKS, T. E.	I	" " "
ROBINSON, W. C.	III	Melrose, Mass.
RUSSELL, A. H.—A. B.	III	Haverhill, Mass.
SNELLING, F. N.	II	" "
SPIEGEL, E.	II	New York
STEVENSON, M. R.	III	Clinton, Mass.
STEWART, W. L.	I	New York
STONE, F. G.	II	No. Andover, Mass.
WHITE, E. H.	V	Graham, N. C.

### ART AND DESIGNING COURSE.

BUTTERFIELD, Miss P. M.	1st year.	Lowell, Mass.
CAMPBELL, Miss L. P.	" "	" "
FINN, Miss J. J.	" "	" "
GOODHUE, Miss A. H.	Post Graduate.	" "
REYNOLDS, Miss I. H.	1st year.	No. Andover, Mass.
SUTCLIFFE, Miss F. L.	" "	" " "
WOODIES, Miss Ida	Post Graduate.	Lowell, Mass.

### Specials.

BOLTON, Miss M. M.	Lowell, Mass.
LAWLER, Miss E. A.	" "
LEE, Miss A. T.	" "
LENNON, Miss K. T.	" "
MACBRAYNE, Lewis E.	" "
MCCARTHY, Miss K. F.	" "
NELSON, THOMAS.	" "
PEIRCE, Miss F. E.	" "
RIORDAN, Miss J. B.	" "
WHITNEY, Miss I. L.	" "
	Total \$2.



FANCY LOOMS

## EVENING STUDENTS.

	COURSE.	YEAR.	
ABBOTT, P. E.	I	1	Lowell, Mass.
ALLAN, A.	III	1	No. Billerica, Mass.
ANDERTON, F.	II	1	Lowell, Mass.
ANDREW, W. E.	I	1	" "
ARMITSTEAD, A. B.	IV	2	" "
ASPINWALL, W.	II	2	Lawrence, Mass.
ASQUITH, A.	III	1	Lowell, Mass.
BAILEY, P.	II	1	" "
BALMFORTH, MARTHA	III	1	No. Billerica, Mass.
BARCLAY, H. J.	IV	1	Lowell, Mass.
BARLOW, R.	V	1	" "
BARNETTE, W. L.	III & I	1 & 2	" "
BARR, I. W.	II	1	" "
BARRETT, T. B.	IV	1	" "
BARRINGTON, J.	IV	1	No. Billerica, Mass.
BARRY, E. J.	III	1	Lowell, Mass.
BASTOW, H.	III	1	Lawrence, Mass.
BEAN, H. C.	VI	1	Lowell, Mass.
BERRY, A. H.	VI	1	" "
BERRY, F. M.	V	2	" "
BIGGS, A. H.	VI	1	" "
BINNS, H.	VI	1	" "
BIXBY, W. H.	I	1	" "
BLINKHORN, O. R.	IV	1	" "
BOOTHROYD, G.	V	1	" "
BOWEN, E. L.	I	2	" "
BOWERS, H. J.	VI	1	" "
BOWKER, J. W.	III	2	" "
BOWRING, G.	VI	1	" "
BRADLEY, R. H.	V	1	" "
BRAINERD, I. L.	I	2	Lawrence, Mass.
BRIDGEFORD, E. W.	VI	1	No. Chelmsford, Mass.
BROOKS, N.	V & III	2 & 3	Lowell, Mass.
BROSMAN, J.	IV	1	" "
BROWN, J. P.	III	1	" "
BROWN, F. S.	III	1	" "
BUCHANAN, H.	V	1	" "
BUCHANAN, J. B.	V	1	" "
BURGHARDT, P.	II	1	Lawrence, Mass.
BURKE, L. J.	IV	1	Lowell, Mass.
BURNS, J. E.	IV	1	" "
BUTTERFIELD, L. H.	IV	1	" "
BUZZELL, W. O.	III	1	Methuen, Mass.
CAHILL, E. J.	IV	1	Lowell, Mass.



ART DEPARTMENT



CAMPBELL, L. H.	VI	1	" "
CARROLL, W. F.	I	1	" "
CARTER, J. W.	VI	1	" "
CASSIDY, J. H.	VI	1	" "
CAWTHRA, A. B.	II	3	Wigginvile, Mass.
CHAMBERLAIN, F. E.	I	1	Jamaica Plain, Mass.
CHIEETHAM, J. J.	III & VI	3 & 1	Lowell, Mass.
CHIPPENDALE, E. W.	II	2	" "
CHISHOLM, T. W.	VI	1	No. Billerica, Mass.
CLARK, W. M.	IV	1	Lowell, Mass.
CLARK, W. J.	V	1	" "
CLAUS, E.	III	2	" "
CLEVELAND, F.	III	1	" "
COBURN, C. F.	IV	1	" "
COLBURN, C.	V	1	Nashua, N. H.
COLEMAN, R. W.	IV	1	Andover, Mass.
COLLIER, A. W.	V & I	1	Somerville, Mass.
COLLINS, R. T.	IV	1	Lowell, Mass.
CGNLGN,	IV	1	Lowell, Mass.
CORNOCK, C.	II	1	" "
COUTU, P.	III	1	" "
COUTURE, M. J.	VI	1	" "
COWDELL, H.	V	2	" "
COWDREY, C. E.	V	1	No. Billerica, Mass.
COWELL, R.	I	1	Lowell, Mass.
CRAIG, C. E.	II	1	" "
CREASER, J. H.	IV	3	" "
CREMIN, D. J.	I	1	" "
CROMPTON, G.	IV	3	" "
CRONIN, W.	IV	1	" "
CROWE, J. F.	II	1	" "
CUNCLIFFE, P.	I	1	" "
CURRIER, J. A.	V	2	No. Andover, Mass.
CURTIS, E. L.	I	1	Lowell, Mass.
DAKIN, J. K.	III	1	" "
DAVIS, H.	II	2	" "
DAWES, H. N., S. B.	II	1	Chelsea, Mass.
DELANEY, J. A.	VI	1	Lowell, Mass.
DENNY, W. J., S. B.	I	1	" "
DEVINE, J. J.	IV	2	" "
DILLON, J.	VI	1	" "
DIMLICK, B. C.	III	1	Lawrence, Mass.
DIXON, H.	IV	1	No. Chelmsford, Mass.
DONNELLAN, F.	V	1	Lowell, Mass.
DONNELLY, N. F.	VI	1	" "
DONAGHEY, T.	II	1	" "
DONOVAN, D. F.	II	1	No. Andover, Mass.
DORE, A.	VI	1	Lowell, Mass.
DOWNES, J. F.	IV	1	" "
DRIVER, J. T.	II	1	" "
DUDLEY, B., Miss	III	1	" "
DUDLEY, G. E.	I	2	" "
DUFFY, S. F.	I	1	" "
DUNSE, R.	III	1	" "
DUPEE, C. F.	I	2	" "
EDGERLEY, R.	VI	1	Lowell, Mass.
ELSTON, F. R.	IV	1	Lawrence, Mass.
EVISON, W. A.	V	2	Lowell, Mass.



FARNELL, R.P.	IV	1	Collinsville, Mass.
FARRELL, T.	II	1	Lowell, Mass.
FEENEY, E. B.	II	1	Andover, Mass.
FERGUSON, H. D.	VI	1	Lowell, Mass.
FERGUSON, T.	V	1	" "
FERNLEY, J. A.	I	1	" "
FIELD, C. W.	VI	1	" "
FILTEAU, J. C.	III	1	" "
FLAGG, F. F.	IV	1	" "
FLINT, J. H.	IV	1	Andover, Mass.
FORTUNE, D.	II	1	Lawrence, Mass.
FOWLER, GEORGE L.	VI	1	Lowell, Mass.
FOXCROFT, A.	I	1	" "
FRALICK, L.	III	1	" "
FRAME, W.	V	2	" "
GAFFNEY, M. J.	I	1	" "
GAGAN, J. H.	V	2	" "
GALE, G. H.	V	1	" "
GARGAN, J.	V	1	" "
GARNER, W.	III	1	No. Billerica, Mass.
GAUNT, W. F.	III	2	Methuen, Mass.
GAUTHIER, G. W.	III	1	Lowell, Mass.
GERRISH, W.	III	3	" "
GILLESPIE, W. L.	VI	1	" "
GOOD, H.	I	2	" "
GOODCHILD, G.	I	1	" "
GRANT, A.	II	1 & 2	" "
GRAVES, A.	III	1	" "
GROURKE, M.	II	2	" "
GULLINE, N. S.	IV	1	" "
HADLEY, H.	II	1	" "
HAGGETT, R. L.	I	1	" "
HAIGH, W.	III	2	" "
HARGROVES, W. W.	III & I	2	" "
HAWARTH, J.	VI & III	1	" "
HAYES, L. C.	III	2	" "
HAZELTINE, F. L.	VI	1	" "
HEALEY, T.	II	1 & 2	" "
HIGGINS, E. J.	II	1	" "
HIGGINS, A. L., Miss	III	1	" "
HILL, D.	II	2	" "
HILLIARD, W. B.	VI	1	" "
HILTZ, P. H.	III	1	" "
HITCHCOCK, T. B.	I	3	" "
HODGSON, A.	II	1	No. Chelmsford, Mass.
HOGAN, J. A.	V	1	No. Billerica, Mass.
HOLDEN, G. N.	V	1	" "
HOLGATE, C. H.	II & V	1	Lowell, Mass.
HOLGATE, B.	III	2	" "
HOLGATE, D. R.	V	1	" "
HOLMES, G. M. R., A. B.	I	1	Boston, Mass.
HOLT, R.	I	1	Lowell, Mass.
HOOLE, H. W.	IV	1	" "
HORAN, C. A.	V	1	" "
HOWARD, J.	III	1	" "
HOYLE, E.	II	1	" "
HUNTER, R.	III	3	Medford, Mass.
HUTTON, C.	III	1	Lowell, Mass.

JACKSON, J.	III	1	Lowell, Mass.
JAQUES, E. W.	III	1	" "
JENNINGS, J.	III	1	" "
JENNINGS, C. S.	VI	1	" "
JENNINGS, E.	II	1	Lawrence, Mass.
JOHNSON, E. A.	II	1	" "
JOHNSON, N. A.	IV	1	Lowell, Mass.
JOHNSON, G. I.	III	1	" "
JONES, E. G.	II	1	" "
JONES, A. E.	I	2	" "
JONES, W. J.	II	3	Lowell, Mass.
JOYCE, P.	III	1	" "
JUDD, A. E.	VI	1	" "
KATZKE, P.	IV	1	" "
KELLY, P.	IV	1	" "
KELLY, T. L.	VI	1	" "
KELLY, T.	IV	1	" "
KELLY, S. J.	VI	1	" "
KELLEY, M. H.	I	2	" "
KENT, E. J.	II	1	Lawrence, Mass.
KENYON, F.	IV	1	Lowell, Mass.
KILLERBY, W.	II	2	" "
KING, C.	V	1	Nashua, N. H.
KITTREDGE, J. S.	IV	1	Lowell, Mass.
KNAPTON, S.	IV	3	" "
KNOWLES, F. E.	I	1	" "
LAMONT, W. M.	II	1	Andover, Mass.
LAW, A.	II	2	Lawrence, Mass.
LAWLISS, A. J.	V	1	Lowell, Mass.
LAWRENCE, C.	I	1	" "
LECLAIRE, P.	IV	1	" "
LEITH, R. W.	IV	1	" "
LEITH, A. F.	VI	1	" "
LEITH, E. E.	III	2	" "
LEWIS, R. D.	III	1	Lawrence, Mass.
LIBBEY, H. A.	IV	1	Haverhill, Mass.
LIBBY, C. R.	VI	1	Lowell, Mass.
LIBBY, C. F.	I	2	" "
LIVESAY, J. E.	V	1	" "
LIVINGSTON, H. R.	IV	3	" "
LORD, W.	III	3	Lawrence, Mass.
LOREGAN, J. T.	VI	1	Lowell, Mass.
MACKAY, R. N.	I	3	" "
MACKAY, D. L.	VI	1	" "
MADEN, H.	II	2	" "
MAGUIRE, G. F.	II	1	" "
MAHER, J. C.	IV	1 & 2	" "
MARJERISON, I. D.	VI	1	Lawrence, Mass.
MARRIOTT, J. E.	V	1	Lowell, Mass.
MASON, F. A.	I	1	" "
MAYNARD, E.	III	1	" "
McALPINE, W.	V	1	" "
McAVOY, W.	II	1	" "
McDONALD, O. B.	VI	1	" "
McGILLY, F. P.	IV	1	" "
McGUIRK, J. M.	VI	1	" "
McGUINNESS, J.	V	1	" "

McILALE, E. P.	III	1	"	"
McKEON, E. P.	I	1	"	"
McMAHON, J. F.	V	1	"	"
McNAB, J. M.	III & V	1	"	"
McQUADE, H. B.	V	2	"	"
McQUADE, M. J.	II	1	Lawrence, Mass.	
McQUAID, A. J.	IV	1	Lowell, Mass.	
McVEY, J. H.	I	1	"	"
MEEHAN, T. H.	IV	1	"	"
MEIKLEJOHN, M.	IV	1	"	"
MERRY, J. I.	II	1	"	"
MINGE, J. C.	I	1	"	"
MOODY, C. E.	IV	1	"	"
MOLLOY, A.	V	1	"	"
MORAN, G. A., S. B.	II	1	Lawrence, Mass.	
MORRIS, F.	V	2	Lowell, Mass.	
MOSLEY, H.	II	2	"	"
MULDOON, J. J.	IV	1	"	"
MUNN, C. F.	III	1	"	"
MYERS, J.	IV	1	"	"
MYERS, JAMES S.	III	1	"	"
NELSON, E. H.	II	1	"	"
NEWTON, J. F.	II	1	Lawrence, Mass.	
NICOL, L. O. A.	VI	1	Lowell, Mass.	
NOBLE, J. T.	III	3	"	"
NUGENT, T. A.	VI	1	"	"
OGLEY, S. A.	II	2	"	"
O'HEIR, O.	IV	1	"	"
O'NEIL, J. H.	IV	1	"	"
OSGOOD, C. F.	VI	1	"	"
PAGE, W. H.	VI	1	"	"
PALMER, G. B.	III	1	"	"
PARK, J.	III	1	"	"
PARKER, P. H.	IV	1	"	"
PARKINSON, J. C.	II	1	"	"
PARSONS, W.	V	2	"	"
PEEL, H.	II	2	Lawrence, Mass.	
PEARSON, A.	III	1	Lowell, Mass.	
PHAIR, H.	II	1	Lawrence, Mass.	
PICKUP, T. W.	IV	2	Lowell, Mass.	
POMEROY, T. O.	III	1	"	"
POTTER, R.	V	1	"	"
POTTER, I.	I	1	"	"
PUFFER, E. F.	IV	1	"	"
QUIGLEY, J. J.	IV	1	"	"
QUIRK, J. J.	V	1	"	"
RAFTERY, M.	IV	1	"	"
RAMSDELL, T. E., B. S.	III	1	"	"
REGAN, W. F.	VI	1	"	"
RENWICK, J. A.	IV	2	"	"
REYNOLDS, H. L.	III & I	3	"	"
REYNOLDS, S. J.	IV	1	"	"
REYNOLDS, J.	III	1	"	"
RIDDICK, H. C.	III	1	"	"
ROACH, M. A., Miss	III	1	"	"
ROBINSON, E. D.	IV	1	"	"
ROCHE, T.	V	1	"	"

ROGERS, F.	VI	1	" "
ROLLASON, G. H. S.	III	1	" "
ROTHIERA, S.	III	1	Lawrence, Mass.
ROWAN, P. J.	II	1	Lowell, Mass.
RUMBELOW, G.	III	1	No. Chelmsford, Mass.
RUSSELL, A. H., B. A.	II	1	Lowell, Mass.
SALISBURY, C. A.	II	1	Lawrence, Mass.
SAUNDERS, E. B.	III & V	3	Lowell, Mass.
SAUNDERS, O. F.	IV	1	" "
SAVAGE, W. E.	IV	1	" "
SAVAGE, II.	IV	1	" "
SCANLON, E. J.	II	2	" "
SCHERMERHORN, G. E.	I	1	Lowell, Mass.
SCHOFIELD, J. J.	III	1	Lawrence, Mass.
SENIOR, J. A.	II	1	Lowell, Mass.
SHANNON, P.	V	2	" "
SHERLOCK, J.	II	1	Methuen, Mass.
SILCOX, A. E.	III	1	Lowell, Mass.
SIMMERS, C.	IV	1	" "
SIMPSON, J. A.	VI	1	" "
SMITH, F.	II	2	Lawrence, Mass.
SMITH, W. H.	II	1	Methuen, Mass.
STAKEM, W. J.	V	1	Lowell, Mass.
STANLEY, J. W.	VI	1	" "
STAPLEFORD, W.	V	1	" "
STEARNS, W. A.	I	1	" "
STEVENSON, W.	III	2	No. Billerica, Mass.
STEVENSON, H. W.	VI	1	Lowell, Mass.
STOKHAM, B. I.	IV	2	" "
STOPHERD, W. H.	IV & VI	1 & 2	" "
STROLLS, C. J.	I	1	" "
SULLIVAN, J.	IV	1	" "
SWIFT, E. S.	III	2	" "
TALFORD, E. D.	III	1	" "
TARR, II. E.	IV	1	" "
TAYLOR, M.	VI	1	" "
THURSTON, A. E.	VI	1	" "
TILTON, E. T.	III	3	" "
TRACY, T. F.	II	1	" "
TRUEWORTHY, E. B.	IV	1	" "
TONGE, M.	III	1	" "
UMPLEBY, T. B.	V	1	No. Billerica, Mass.
UNDERDOWN, W. H.	III	1	Lowell, Mass.
UPTON, F. A.	I	1	" "
VANTASSEL, R. W.	VI	1	" "
VARNEY, M. H.	III & I	1 & 2	" "
VINCENT, A.	V	1	" "
VOGT, A.	III	2	Lawrence, Mass.
WALKER, D.	III	2	Collinsville, Mass.
WALKER, C. W.	VI	1	No. Billerica, Mass.
WALSH, T. F.	III	1	Lowell, Mass.
WEBSTER, A.	III	1	Lawrence, Mass.
WEBSTER, H.	III & II	1	" "
WELCH, R. F.	I	1	Lowell, Mass.
WELCH, W. H.	III	2	" "
WESSON, P. B., S. B.	I	1	" "
WHITCOMB, ETHEL, A. B.	IV	2	" "

WHITAKER, C.	VI	1	Tyngsboro, Mass.
WHITAKER, J.	II	1	Lowell, Mass.
WHITEHEAD, B.	II	2	Methuen, Mass.
WHITWORTH, A.	V	1	Lowell, Mass.
WHITWORTH, J.	V	1	" "
WIGGINS, J. R.	III	1	" "
WILKINSON, J. R.	IV	1	" "
WILLEY, F. S.	I	3	Lawrence, Mass.
WILMOT, J.	III	2	Lowell, Mass.
WILSON, R. A.	II	1	Methuen, Mass.
WILSON, G. H.	II	1	Lawrence, Mass.
WILSON, C. E.	II	1	Methuen, Mass.
WISE, P. T.	I	2	Lowell, Mass.
WOOD, J.	I	2	" "
WOODBURY, W. S.	V	1	Lawrence, Mass.
WOODCOCK, F.	VI	1	Lowell, Mass.
WYMAN, C. H.	V	1	" "
YOUNG, A. J.	III	1	" "

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#### SUMMARY:

Evening Students	.	.	.	.	.	.	.	349
Day Students	.	.	.	.	.	.	.	82
								<hr/> 431
Deduct names counted twice	.	.	.	.	.	.	.	7
								<hr/> 424

## GRADUATES CLASS OF 1901.

### WITH TITLES OF THESES.

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BUCHAN, DONALD C.	II	Andover, Mass.
	"Knowles Head Motion."	
CURRIER, JOHN A.	II	Andover Depot, Mass.
	"A New Device for Actuating an Oscillating Reed."	
EWER, N. T., Ph. B.	IV	Lowell, Mass.
	"A Study of the Production of Turkey Red."	
FOSTER, C. E.	II	Lowell, Mass.
	"Jacquard Heads."	
KINGSBURY, P. F.	IV	Lowell, Mass.
	"Investigation of the Natural Impurities Contained in Cotton."	
MARINEL, W. N.	I.	No. Chelmsford, Mass.
	"Variations of Fly Frame Tension due to Radial Link Action."	
MOOREHOUSE, W. R.	IV	Lowell, Mass.
	"The Machinery used in the Art of Textile Coloring and Bleaching."	
PARKER, B. M.	I	Lowell, Mass.
	"Discussion of Fly Frame Cones."	
WEBBER, A. H.	IV	Beverly, Mass.
	"Comparison of the Results Obtained by Dyeing Wool with Logwood Chips and Logwood Extract on a Prussian Blue Bottom."	
WISE, P. T.	II	Malden, Mass.
	"Effect of Ratch on Breaking Strength of Single 28's Worsted Yarn "	

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### CERTIFICATES.

J. C. MINGE,	Cotton Spinning and Weaving.
R. H. BRADLEY,	Weaving.

### POST GRADUATES.

IDA A. WOODIES,	Art Department.
AMY H. GOODHUE,	Art Department.



# CERTIFICATES AWARDED TO EVENING GRADUATES, MAY 23, 1901.

Thomas Barnes Hitchcock, A. B.,	Lowell, Mass.	Cotton Spinning.
Frank S. Willey,	Lawrence, Mass.	" "
Paul Bancroft Wesson, S. B.,	Lowell, Mass.	" "
Edward S. Swift,	" "	" "
Ernest Nelson,	" " Woolen and Worsted Spin.	" " " "
William J. Jones,	" " " " " "	" " " "
Thomas Barnes Hitchcock, A. B.,	" " Woolen Spinning.	" " " "
Daniel F. Donovan,	No. Andover, Mass.	" "
Thomas Farrell,	Lowell, Mass.	" "
Paul Carl Burghardt,	Lawrence, Mass.	" "
Charles Henry Holgate.	Lowell, Mass.	" "
William Aspinwall,	Lawrence, Mass.	Worsted Spinning.
Edward J. Scanlon,	" "	" "
Walter Killerby,	Lowell, Mass.	" "
Hudson Peel,	Lawrence, Mass.	" "
Alfred Law,	" "	" "
Archibald Grant,	Lowell, Mass.	" "
Michael Groucke,	" " " "	" "
Bennett Whitehead,	Methuen, Mass.	" "
Fred Smith,	Lawrence, Mass.	" "
Ernest W. Chippendale,	Lowell, Mass.	" "
Daniel Hill,	" "	" "
Henry Davis,	" "	" "
Noah Brooks,	" " Designing.	" "
William Oscar Buzzell,	Methuen, Mass.	" "
John James Cheetham,	Lowell, Mass.	" "
Thomas Barnes Hitchcock, A. B.,	" " " "	" "
Ralph Hunter,	Medford, Mass.	" "
Wilfred Lord,	Lawrence, Mass.	" "
Jackson Chadwick Minge,	Lowell, Mass.	" "
John T. Noble,	" "	" "
Hiram Leland Reynolds,	" "	" "
Edward Burnett Saunders,	" "	" "
Isaac F. Willainson,	" " Chemistry and Dyeing.	" "
Hugh B. McQuade,	" " Weaving.	" "
Phillip Shannon,	" " " "	" "
Frank Morris,	" " " "	" "
Frank M. Berry,	" " " "	" "
William Frame,	" " " "	" "
Herbert Cowdell,	" " " "	" "
William A. Evison,	" " " "	" "
John H. Gagan,	" " " "	" "
Noah Brooks,	" " " "	" "

## REGISTER OF FORMER DAY STUDENTS.

NAME.	YEAR.	COURSE.	OCCUPATION.
A. L. BALDWIN	1900	IV	Chemist with S. J. Corey, Dealer in Dye-stuffs, 273 Congress St., Boston.
J. W. BAILEY	1899	I	Head of Carding and Spinning Dept., Georgia School of Technology.
I. W. BARR	1900	I	Ass't. Instructor in Design, Lowell Textile School, Lowell, Mass.
R. H. BRADLEY		V	Loom Fixer, Atlantic Mills, Providence, R. I.
H. A. BODWELL	1900	II	Examiner of Machinery, Port of Boston, Boston, Mass.
C. J. BRICKETT	1900	II	Instructor Woolen Dept. New Bedford Textile School, New Bedford, Mass.
KATHERINE BURRAGE	1899	Art	856 Gorham St., Lowell, Mass., U. S. A.
J. A. CURRIER,	1901	II	Inspector of Textile Fabrics, U. S. Government, Boston, Mass.
J. H. CUTTLE	1899	III	Ass't. Designer, Arlington Mills, Boston Office, Boston, Mass.
A. B. FELS	1899	II	Traveling Salesman, 26 Chauncy St., Boston, Mass.
W. F. HASKELL		IV	With S. D. Warren, Cumberland Mills, Maine.
J. J. HONIKER		III	Weaver Middlesex Co., Lowell, Mass.
L. R. KERR,	1899	III	Ass't. Designer, Boott Cotton Mills, Lowell, Mass.
G. F. LAMSON	1900	I	Draftsman Lewiston Machine Co., Lewiston, Me.
J. M. McALLISTER		I	Treas. Worth Mfg. Co., Worthville, N. C.
T. E. MITCHELL		I	Manager and Supt. Belton Cotton Mills, Belton, Texas.
W. R. MOOREHOUSE,	1901	II	Ass't. Instructor in Chemistry, Lowell Textile School, Lowell, Mass.
WM. OXLEY		II	With Oxford Woolen Co., Oxford, N. S.
H. C. PARKER	1900	III	112 Pleasant Ave., Fitchburg Mass.
J. E. PERKINS	1900	III	Designer Nockeage Mills, Fitchburg, Mass.
A. J. PRADEL	1900	III	Instructor Hand Looms, Lowell Textile School, Lowell, Mass.
S. E. SMITH	1900	I	Assistant Instructor Cotton Spinning, Lowell Textile School, Lowell, Mass.
A. A. STEWART	1900	II	Instructor Woolen and Worsted Dept., Lowell Textile School, Lowell, Mass.
J. F. SYME	1900	II	With Washington Mills, Lawrence, Mass.
E. T. TILTON	1899	II	Weaver, U. S. Bunting Co., Lowell, Mass.
IDA WOODIES	1900	Art	Ass't. Instructor in Decorative Art, Lowell Textile School, Lowell, Mass.

## REGISTER OF FORMER EVENING STUDENTS.

F. M. BERRY	1901	III	Designer, Columbia, S. C.
HEATON BINNS	1900	II	Overseer Ingrain Worsted Yarn Dept., Bigelow Carpet Co., Lowell, Mass.
J. T. BROADBENT	1899	I	Instructor Cotton Spinning, New Bedford Textile School, New Bedford, Mass.
A. D. CAMPBELL	1900	II	Section-hand Arlington Mills, Lawrence, Mass.
C. E. CARTER		I	Mining, Bisbu, Arizona, Lowell and Arizona Mining Co.
A. B. CAWTHRA	1900	II	Overseer Worsted Spinning, U. S. Bunting Co., Lowell, Mass.
A. D. COLBY	1900	I	Draftsman Lowell Machine Shop, Lowell, Mass.
J. COLLIER	1899	III	Overseer Weaving, No. Chelmsford, Mass.

H. H. CROMPTON	1899	II	Second-hand Worsted Spinning, Arlington Mills, Lawrence, Mass.
M. H. CULLIMAN	1900	I	Carder, 111 So. Highland St., Lowell, Mass.
J. DONNELLY	1900	I	Section-hand Mule Spinning, 294 Varnum Ave., Lowell, Mass.
F. R. ELSTON	1900	III	Pin-setter, Arlington Mills, Lawrence, Mass.
J. H. GAGAN	1901	V	Cloth Inspector, Stirling Mills, Lowell, Mass.
A. C. GAUNT	1899	III	Designer Tremont Worsted Co., Methuen, Mass.
C. F. HARMON	1899	I	250 High St., Lowell, Mass.
W. M. HASTINGS			Textile World Pub. Co., Boston, Mass.
J. HOWARD	1900	V	Overseer Weaving, Belvidere Woolen Co., Lowell, Mass.
C. HUTTON	1900	V	Loom Fixer, 93 Humphrey St., Lowell, Mass.
W. J. JONES	1900	II	Overseer Worsted Spinning, U. S. Bunting Co., Lowell, Mass.
W. KERSHAW	1900	V	Loom-fixer, Bigelow Carpet Co., Lowell, Mass.
H. MADEN	1900	II	Second-hand, Worsted Spinning, U. S. Bunting Co., Lowell, Mass.
I. D. MARJERISON	1899	II	Second-hand, Worsted Combing, Arlington Mills, Lawrence, Mass.
A. MARSHALL	1900	V	Ass't Designer, Arlington Mills, Lawrence, Mass.
A. L. MOIR	1899	III	Letter Carrier, 151 West 6th St., Lowell, Mass.
E. H. NELSON	1900	II	Second-hand Worsted Carding, U. S. Bunting, Lowell, Mass.
J. T. NOBLE	1901	III	Book-keeper, Walsh Mill, Lowell, Mass.
T. A. NUGENT	1899	II, V	Second-hand Worsted Spinning, Bigelow Carpet Co., Lowell, Mass.
S. A. OGLEY	1900	II	Second-hand Worsted Spinning, Moore's Mill, No. Chelmsford, Mass.
C. F. OSGOOD	1900	I	Machinist, Lowell Machine Shop., Lowell, Mass.
H. E. PICKERING	1900	I	Ass't Supt. Pickering Mfg. Co., Lowell, Mass.
C. A. ROBINSON,		III	Designer, Providence, R. I., 1492 Westminster St.
A. E. SILCOX	1900	I	Draftsman, Lowell Machine Shop, Lowell, Mass.
F. L. SNOW	1900	IV	Overseer Dyeing, Lawrence Mfg. Co., Lowell, Mass.
E. H. SPEDDING	1899	III	Second-hand Weaving, Tremont & Suffolk Mills, Lowell, Mass.
W. STEVENSON	1899	II	Second-hand Woolen Dept., Talbot Mills, No. Billerica, Mass.
A. STERLING		III	Designer and Overseer of Fancy Weaving, Lyman Mills, Holyoke, Mass.
W. H. STOPHERD	1899	II	Overseer Axminster Worsted Yarn Dept., Bigelow Carpet Co., Lowell, Mass.
T. B. UMPLEBY		V	Ass't Designer, Talbot Mills, No. Billerica, Mass.
J. WATERHOUSE	1900	IV	Store-keeper Merrimack Print Works, Lowell, Mass.
P. B. WESSON	1901	I	Foreman Lowell Machine Shop, Lowell, Mass.
C. T. WING	1900	III	Ass't Designer, Middlesex Co., Lowell, Mass.
W. S. WOODBURY	1900	I	Second hand Carding, Pacific Mills, Lawrence, Mass.

## CONTRIBUTIONS.

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Contributions or loans of machinery, apparatus or material, kindnesses extended or assistance rendered by the following firms or persons are acknowledged with thanks : —

Actien Gesellschaft fur Anilin Fabrikaten, Berlin.  
Altemus, W. W., Philadelphia, Pa.  
Ameledema Oilless Bearing Co., Philadelphia, Pa.  
American Card Clothing Co., Lowell, Mass.  
American Crayon Co., Lowell, Mass.  
American Drosophore Co., Boston, Mass.  
American Woolen Co., Boston, Mass.  
Amraytoon Tube Co., Lowell, Mass.  
Appleton Co., Lowell, Mass.  
Arabol Mfg. Co., New York City.  
Arlington Mills, Lawrence, Mass.  
Atlas Mfg. Co., Newark, N. J.  
Atwood Machine Co., Stonington, Conn.  
Avery Chemical Co., Littleton, Mass.  
Badische Anilin und Soda Fabrik, Germany.  
Barbour Bros., Boston, Mass.  
Bartlett & Dow, Lowell, Mass.  
Battles, J., Lawrence, Mass.  
Bay Staté Mills, Lowell, Mass.  
Beach & Co., Hartford, Conn.  
Bennett, Frank P., Boston, Mass.  
Berry, A. Hun, Boston, Mass.  
Bigelow Carpet Co., Lowell, Mass.  
Boott Mills, Lowell, Mass.  
Boston Herald, Boston, Mass.  
Boston Journal of Commerce, Boston, Mass.  
Boston Transcript, Boston, Mass.  
Brightwood Mfg. Co., No. Andover, Mass.  
British Alizarin Co., England.  
Brown, Wm. H., Worcester, Mass.  
Cameron & Co., A. J., Boston, Mass.

Capron, C. C., Uxbridge, Mass.  
 Carruthers, Robert, Lowell, Mass.  
 Carey, W. W., Lowell, Mass.  
 Clark, Jeremiah, Lowell, Mass.  
 Coats, J. & P., Pawtucket, R. I.  
 Coburn, C. B. & Co., Lowell, Mass.  
 Coburn Shuttle Co., Lowell, Mass.  
 Commercial Bulletin, Boston, Mass.  
 Consolidated Prior Cotton Gin & Wood Burrer Co., London, Eng.  
 Crompton-Knowles Loom Works, Worcester, Mass., and Providence, R. I.  
 Davis & Furber Machine Co., North Andover Depot, Mass.  
 Draper Co., Hopedale, Mass.  
 Dry Goods Economist, New York.  
 Entwistle, T. C., Lowell, Mass.  
 Emmons Loom Harness Co., Lawrence, Mass.  
 Factory Insurance Association, Hartford, Conn.  
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 Firth, Wm., Boston, Mass.  
 Furbush Machine Co., Philadelphia, Pa.  
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 General Fire Extinguisher Co., Providence, R. I.  
 Gherli, A., New York, N. Y.  
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 Gilbert Loom Co., Worcester, Mass.  
 Hamilton Mills, Lowell, Mass.  
 Hamilton Print Works, Lowell, Mass.  
 Harris, G. W., Lowell, Mass.  
 Harwood, G. S. & Son, Boston, Mass.  
 Holyoke Machine Co., Worcester, Mass.  
 Howard Bros, Worcester, Mass.  
 Haworth & Watson, Lowell, Mass.  
 Jacques Shuttle Co., Lowell, Mass.  
 Johns, H. W. & Co., New York, N. Y.  
 Kalle & Co., New York, N. Y.  
 Kalle & Co., Boston, Mass.  
 Kittredge, H. G., Boston, Mass.  
 Kitson Machine Co., Lowell, Mass.  
 Knowles Loom Works, Worcester, Mass.  
 Kunhardt, Geo. E., Lawrence, Mass.  
 Laminar Fibre Co., Cambridge, Mass.  
 Lawrence Manufacturing Co., Lowell, Mass.  
 Leominster Woolen Co., Leominster, Mass.  
 Leopold, Cassella, Germany.  
 Lewiston Machine Co., Lewiston, Me.

Leyland Belting Co., Lawrence, Mass.  
 Lowell Manufacturing Co., Lowell, Mass.  
 Lowell Machine Shop, Lowell, Mass.  
 Lyon, A. S., Lowell, Mass.  
 Main Belting Co., Boston, Mass.  
 Massachusetts Co., Lowell, Mass.  
 Mason Machine Works, Taunton, Mass.  
 Merrimack Co., Lowell, Mass.  
 Mather & Platt, England.  
 Mathieson, W. J. & Co., Boston, Mass.  
 Mauger & Avery, Boston, Mass.  
 Mayo Knitting Machine Co., Franklin, N. H.  
 Meister, Lucius & Brunning, Germany.  
 Montgomery, J. R. & Co., Windsor, Conn.  
 Nat. Assn. of Wool Mfrs., Boston, Mass.  
 New England Bunting Co., Lowell, Mass.  
 N. E. Cotton Mfrs. Assn., Boston, Mass.  
 New York & Boston Dyewood Co., Boston, Mass.  
 Nichol, W. G., Chester, S. C.  
 Olney Bros., Providence, R. I.  
 Pacific Mills, Lawrence, Mass.  
 Parker, W. H. & Sons, Lowell, Mass.  
 Parks & Woolson, Winchester, Vt.  
 Phillips & Co., Providence, R. I.  
 Pickering Knitting Co., Lowell, Mass.  
 Pickhardt & Kuttroff, Boston, Mass.  
 Pocasset Worsted Co., Thornton, R. I.  
 Prince, Smith & Son, Keighly, England.  
 Read, Holiday & Co., Boston, Mass.  
 Rodney Hunt Machine Co., Orange, Mass.  
 Roy, B. S., Worcester, Mass.  
 Royle, John & Son, Paterson, N. J.  
 Roessler & Hasslacher Chemical Co., New York.  
 Sargent's Sons, C. G., Graniteville, Mass.  
 Schoelkopp Aniline & Chemical Co., Buffalo, N. Y.  
 Shaw Stocking Co., Lowell, Mass.  
 Star Worsted Co., Fitchburg, Mass.  
 Steel Heddle Co., Philadelphia, Pa.  
 Stevens, M. T. & Sons, No. Andover, Mass.  
 Stirling Mills, Lowell, Mass.  
 Stoddard, Haserick & Richards, Boston, Mass.  
 Sturtevant, B. F. Co., Jamaica Plain, Mass.  
 Sullivan Machinery Co., Claremont, N. H.  
 Talbot Mills, North Billerica, Mass.  
 Talbot Dyewood & Chemical Co., Lowell, Mass.



Textile Excelsior, Charlotte, N. C.  
Textile Manufacturers Journal, New York.  
Textile World, Boston, Mass.  
Thompson Hardware Co., Lowell, Mass.  
Tillinghast, Stiles & Co., Providence, R. I.  
Tolhurst, W. H. & Son, Troy, N. Y.  
Torrence Mfg. Co. Harrison, N. J.  
Tremont & Suffolk Mills, Lowell, Mass.  
Union Shuttle Co., Lawrence, Mass.  
United States Aerophor Air Moistening Co, Providence, R. I.  
United States Bunting Co., Lowell, Mass.  
Universal Winding Co, Boston, Mass.  
Victor, Koechl & Co., Boston, Mass.  
Wade, J. M., Boston, Mass.  
Walsh, Thomas, Lowell, Mass.  
Warren Mills, Centreville, R. I.  
Washington Mills, Lawrence, Mass.  
Wattles, L. R., Canton Junction, Mass.  
Whiting, Henry F., Lowell, Mass.  
Whitin Machine Works, Whitinsville, Mass.  
Whitely, John & Son, Halifax, England.  
Williams Roving Carrier Co., Naugatuck, Mass.  
Wool & Cotton Reporter, Boston, Mass.  
Woodley, Soap Manufacturing Co., Foxboro, Mass.

DEDICATION

OF THE

LOWELL TEXTILE  
SCHOOL

LOWELL, MASSACHUSETTS



FEBRUARY TWELFTH, 1903



*Southwick Hall, and Co.  
111. North St., and  
Boston, Mass.*

SOUTHWICK HALL  
OCCUPIED JAN. 12, 1903

# FORMAL EXERCISES

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IN MAIN HALL AT  
2.30 P. M.

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## Invocation

The Right Reverend WILLIAM LAWRENCE  
Bishop of Massachusetts

## Introduction

FRANKLIN W. HOBBS  
Chairman of the Committee on Dedication  
Trustee on the part of the Commonwealth

## Welcome

His Honor CHARLES E. HOWE  
Mayor of Lowell  
Trustee Ex-officio

## Response in Behalf of the Commonwealth

His Excellency JOHN L. BATES  
Governor of the Commonwealth

## The Textile Industry and its Educational Needs

Trustee A. G. CUMNOCK  
President of the Board of Trustees of the  
Lowell Textile School

## Address: The New England Supremacy in the Twentieth Century

Trustee HENRY S. PRITCHETT, L. L. D.  
President of the  
Massachusetts Institute of Technology

## In Behalf of the Wool Manufacturers

WILLIAM WHITMAN  
Chairman of Executive Board of the  
National Association of Wool Manufacturers

## In Behalf of the Cotton Manufacturers

CHARLES H. FISH  
President of  
New England Cotton Manufacturers Association

## In Conclusion: The Lowell Textile School

Trustee JAMES T. SMITH  
Clerk of the Corporation



KITSON HALL  
OCCUPIED JAN. 12, 1903

# M E N U

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Chicken Salad

Escalloped Oysters

Macaroni and Cheese Croquettes

Olives

Potatoe Croquettes

Green Peas

Finger Rolls

Sandwiches

Harlequin Creams

Frozen Pudding

Assorted Cakes

Coffee

DEDICATION OF THE  
LOWELL TEXTILE SCHOOL  
FEBRUARY 12, 1903.

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SERVED FROM 1 TO 2.30 P. M. IN HAND  
LOOM HALL, THIRD FLOOR, SOUTHWICK  
HALL. ONLY ENTRANCE FROM CHEM-  
ISTRY WING.

PAGE CATERING COMPANY,  
LOWELL, MASS.





FALMOUTH STREET BUILDING

TWO-STORY PORTION OCCUPIED JAN. 12, 1903. AID ASKED TO FINISH

## LOWELL TEXTILE SCHOOL.

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THE school was established and is managed by a corporation styled the "Trustees of the Lowell Textile School," composed of twenty-seven members, under Chapter 475, Public Acts, 1895.

The following data will be of interest.

Number of departments :—

Cotton Yarns,  
Woolen and Worsted Yarns,  
Weaving  
Decorative Art,  
Textile Design,  
Mechanical Engineering,  
Electrical Engineering,  
Chemistry and Dyeing,  
Finishing,  
Commercial Languages.

*Handwritten note:* } — 10 departments

The equipment includes knitting, a division of cotton yarns ; and silk spinning, a division of weaving.

The present buildings, the permanent home, were begun in 1892 and occupied Jan. 12, 1903. They are as follows :—

Southwick Hall named in memory of Royal Southwick, a leading public man and early textile manufacturer at Lowell and vicinity. It was built by the Commonwealth of Massachusetts and Frederick Fanning Ayer, esquire, of New York City, a native of Lowell,

*Handwritten note:* buildings

This Hall

with large interests there in textile manufacture. It is built of buff brick and is substantial in construction and imposing in architecture. It is composed of a central mass of three stories, and two wings, each of two stories. The dimensions are 260 x 85 feet, the available floor space being about 68,000 square feet.

Kitson Hall, a memorial to Richard Kitson, founder of the Kitson Machine Company of Lowell, was erected by his daughters, Charlotte P. Kitson and Emma K. Stott, and the Kitson Company. It is of buff brick, one story; the dimensions being, with the boiler house, erected by the Commonwealth, 275 x 60 feet.

The Falmouth Street building is of buff brick, two stories; the dimensions being, so far as at present constructed and occupied, 120 x 78 feet.

The basis of all the buildings is mill construction, with such additions as make them available and suitable for educational purposes.

The value of the entire plant is estimated as follows :

School site—nine acres—contributed	.	.	\$100,000
Equipment	.	.	100,000
Buildings	.	.	225,000
Total	.	.	\$425,000

Of this amount the Commonwealth has contributed \$91,750. In addition, at the outset, the Commonwealth contributed \$25,000, and the City of Lowell an equal amount for the establishment and earlier maintenance of the school, and the former has since met the deficiency of the day school, ranging from \$15,000 to \$20,000 annually, while the latter meets the deficiency of the evening school, ranging from \$5,000 to \$8,000. Residents of Lowell receive free evening instruction as a condition of such grants.

The site of the school is an imposing one overlooking the falls of the Merrimack, where power loom weaving was first established on an extensive scale on this continent, for the founders of the Lowell Mills were the founders of the textile industry of America.

The plan of the buildings groups them in the form of a parallelogram 355 x 260 linear feet outside, enclosing a court entered by an arch driveway through the centre of Southwick Hall. The present buildings complete three sides of this plan, the fourth being reserved for future growth.

Adjoining the buildings are ample athletic and recreation grounds which also protect from objectionable neighbors and fire. Five acres of the site were purchased from contributions by and at the request of Frederick Fanning Ayer, esquire, of New York city, and four acres are the gift of the proprietors of the Locks and Canals on Merrimack River, who represent the textile corporations of Lowell.

The school was necessarily established on a broader base than any foreign textile school, as abroad each textile district deals with but one class of fibres and frequently with but one process of its manufacture, and thus schools are confined to that fibre or process and are comparatively inexpensive, while Lowell, whose leading specialty is cotton manufacture, also embraces wool, silk, ramie, and elastic and mixed goods, and Lawrence, whose leading specialty is woollen and worsted, embraces like variety; and outside of these leading textile cities, within the watershed of the Merrimack, are numerous textile towns and villages with like variety of products. These various mills make constant demands on the school and form valuable adjuncts for instruction utilized by the instructors.

The total number of day scholars is 116, and of evening students, 429; making a total of 545. Their

residence is as follows: Massachusetts, 95; other New England states, 10; New York, 4; New Jersey, 1; Southern States, 6.

The number of localities in Massachusetts represented is 41. The number of day pupils from the higher institutions of learning—universities, colleges, military academy, and Institute of Technology is 20, though the larger body is still from the high schools and academies, the number having reached 82.



# Trustees of the Lowell Textile School.

(Incorporated 1895 under Chapter 475, Acts of 1895.)

## ON THE PART OF THE COMMONWEALTH.

A. S. Covell, Boston, Treasurer Tremont and Suffolk Mills, Lowell.  
Franklin W. Hobbs, Brookline, Assistant Treasurer Arlington Mills, Lawrence.

## EX-OFFICIO.

Charles E. Howe, Mayor, Lowell.  
A. K. Whitcomb, Superintendent of Schools, Lowell.  
James F. Miskell<sup>a</sup>, Chairman Board of Alderman, Lowell.  
Cecil L. Adams, President Common Council, Lowell.  
Michael Duggan, Lowell, Representing Lowell Textile Council.

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Charles L. Hildreth, Lowell, Superintendent Lowell Machine Shop.  
Eugene S. Hylan, Lowell, Treasurer New England Bunting Co.  
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George E. Kunhardt, Lawrence, Woolen Manufacturer.  
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Henry S. Pritchett, Boston, President Massachusetts Institute of Technology.  
Charles H. Hutchins, Worcester, President Crompton & Knowles Loom Works.

## HONORARY TRUSTEE.

Frederick F. Ayer, New York.

## OFFICERS 1903.

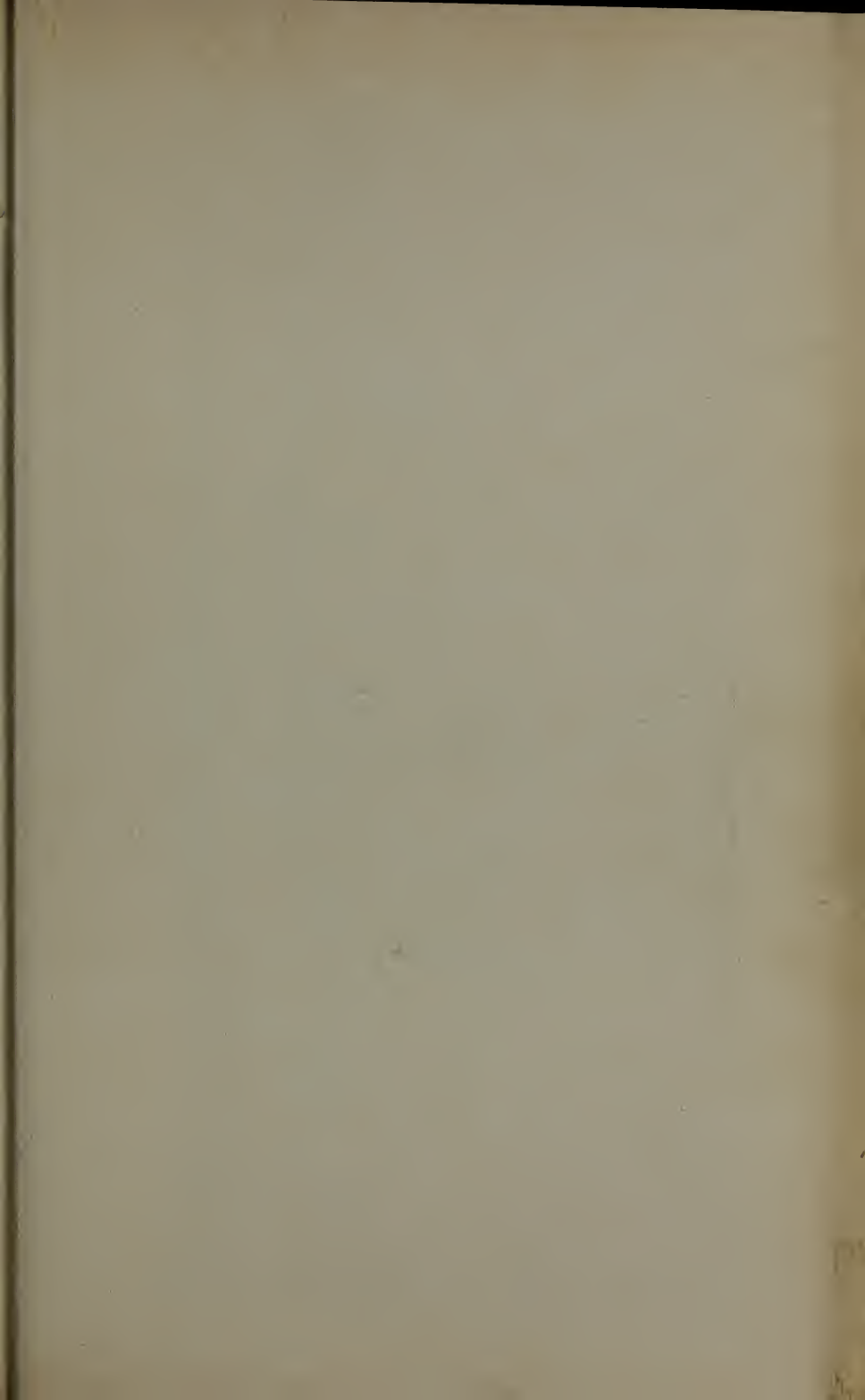
A. G. Cumnock, President.  
A. S. Covell, Vice-President.

James T. Smith, Clerk.

A. G. Pollard, Treasurer.









## SOUTHWICK HALL

GENERAL ADMINISTRATION AND CHEMISTRY, DYING, FINISHING, MECHANICAL AND ELECTRICAL ENGINEERING,  
DESIGN, DECORATIVE ART, AND COMMERCIAL DEPARTMENTS

SERIES 6, No. 1.

AUGUST, 1902

BULLETIN  
OF THE  
Lowell Textile School  
LOWELL, MASS.



*Issued Quarterly*

1902 - 1903



Moody Street and Colonial Avenue



KITSON HALL  
COTTON YARN DEPARTMENT

# Trustees of the Lowell Textile School.

[Incorporated 1895.]

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## OFFICERS 1902.

A. G. CUMNOCK, President.  
A. G. POLLARD, Treasurer.

A. S. COVEL, Vice-President.  
JAMES T. SMITH, Clerk.

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## HONORARY TRUSTEE.

FREDERICK FANNING AYER,  
New York.

---

## TRUSTEES.

On the part of the Commonwealth of Massachusetts.

A. S. COVEL, Boston, 1904.

FRANKLIN W. HOBBS, Brookline, 1902.

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## TRUSTEES EX-OFFICIO.

HON. WM. E. BADGER,  
Acting Mayor of Lowell,  
Chairman Lowell Board of Aldermen.

A. K. WHITCOMB,  
Supt. of Schools, Lowell.  
JAMES G. HILL,  
President Lowell Common Council.

MICHAEL DUGGAN,  
By appointment of the Lowell Textile Council.

---

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A. G. CUMNOCK, Treasurer Appleton Co., Lowell.

CHARLES H. HUTCHINS, President Crompton & Knowles Loom Works, Worcester,  
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CHARLES L. HILDRETH, Supt. Lowell Machine Shop, Lowell.

EUGENE S. HYLAN, Treasurer New England Bunting Co., Lowell.

JACOB ROGERS, Banker, Lowell.

FREDERIC S. CLARK, Treasurer Talbot Mills, North Billerica.

JAMES T. SMITH, Attorney at Law, Lowell.

JOSEPH L. CHALIFOUX, Merchant, Lowell.

ALVIN S. LYON, Agent Bigelow Carpet Co., Lowell.

HON. FREDERICK LAWTON, Justice Superior Court, Lowell.

THOMAS WALSH, Supt. Hamilton Print Works, Lowell.

HAVEN C. PERHAM, Treasurer Kitson Machine Co., Lowell.

WALTER E. PARKER, Agent Pacific Mills, Lawrence.

A. G. POLLARD, President Lowell Hosiery Co., Lowell.

J. W. C. PICKERING, Treasurer Pickering Knitting Co., Lowell.

WM. M. WOOD, Treasurer American Woolen Co., Andover.

FRANKLIN NOURSE, Agent Lawrence Mfg. Co., Lowell, Mass.

GEORGE E. KUNHARDT, Woolen Manufacturer, Lawrence.

FRANK E. DUNBAR, Attorney at Law, Lowell.

DR. HENRY S. PRITCHETT, President Mass. Institute of Technology.

Vice EDWARD D. HOLDEN, Deceased.





FALMOUTH STREET BUILDING  
WEAVING, AND WOOLEN AND WORSTED SPINNING DEPARTMENTS

## Officers of Instruction

---

Principal of the School and Professor of Mechanical Engineering,  
WILLIAM W. CROSBY, S. B., M. E.

Professor of Textile Design and Fabric Structure,  
FENWICK UMPLEBY.

Professor of Chemistry and Dyeing,  
LOUIS A. OLNEY, A. C.

Head Instructor in Warp Preparation and Weaving,  
WILLIAM NELSON.

Professor of Decorative Art,  
VESPER L. GEORGE.

Head Instructor in Woolen and Worsted Spinning,  
EDGAR H. BARKER.

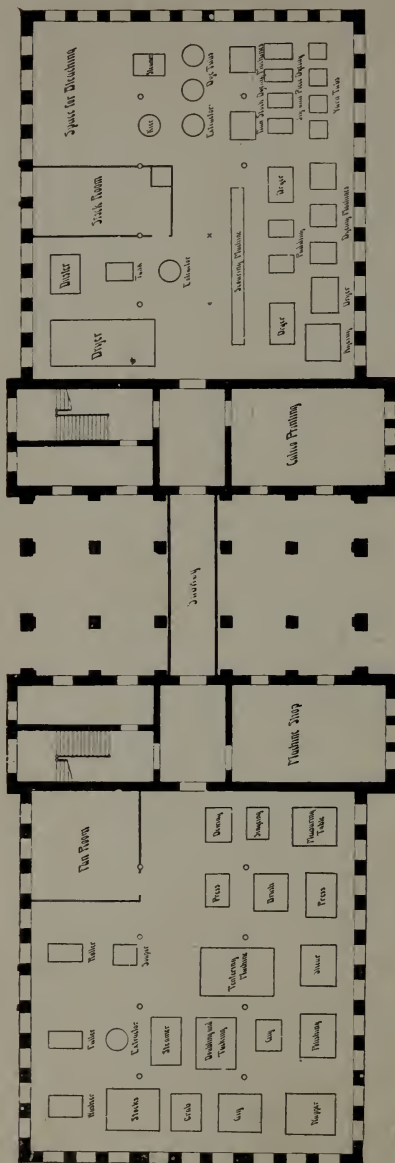
Head Instructor in Cotton Spinning,  
OTIS L. HUMPHREY.

Instructor in Chemistry,  
G. CARL SPENCER, S. B.

Instructor in Mechanical Engineering.  
GEORGE H. PERKINS, S. B.

Instructor in Woolen and Worsted Spinning and Finishing,  
ARTHUR A. STEWART.

Instructor in Hand Loom Department,  
A. J. PRADEL.



BASMENT SOUTHWICK HALL

Instructor in Chemistry,  
 PHILIP R. FRENCH, S. B.

Instructor in Textile Design,  
 I. WALWIN BARR.

Instructor in Cotton Spinning.  
 STEPHEN E. SMITH.

Instructor in Free Hand Drawing,  
 IDA A. WOODIES.

Instructor in Dyeing,  
 WM. R. MOOREHOUSE.

Instructor in Power Weaving,  
 DONALD C. BUCHAN.

Instructor in Electrical Engineering,  
 EDWIN E. NELSON, S. B.

Modern Languages in charge of  
 PAUL E. KUNZER, PH. D.

## Faculty

FENWICK UMPLEBY.  
 LOUIS A. OLNEY.  
 VESPER L. GEORGE.

WILLIAM W. CROSBY.

EDGAR H. BARKER.  
 WILLIAM NELSON.  
 OTIS L. HUMPHREY.

## Lecturers.

WILLIAM L. CHURCH, of the firm of Lockwood, Greene & Co., Boston,  
 Electric Power Transmission.

HENRY G. KITTREDGE, Textile Expert and Journalist. Fibres.

S. N. D. NORTH, Secretary National Association Wool Manufacturers.

ARTHUR T. SAFFORD, A. M., Assistant Engineer Locks and Canals Co.,  
 Lowell, Mass. Water Power.

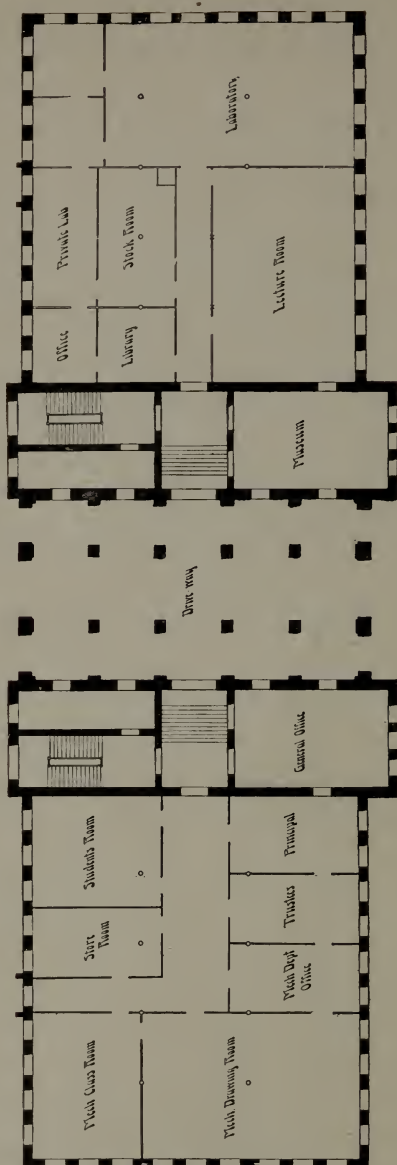
WALTER B. SNOW, S. B., with B. F. Sturtevant Co., Boston. The Heating  
 and Ventilation of Textile Mills.

CHANNING WHITAKER, S. B., M. E., Adviser of Lowell Machine Shop in  
 Questions of Patents. Patent Law.

ARTHUR K. WHITCOMB, A. B., Supt. of Schools, Lowell. How to Study.

C. J. H. WOODBURY, A. M., Boston, Secretary New England Cotton Manu-  
 facturers' Association. Development of the Modern Mill.

C. HOWARD WALKER, Director Mass. School of Design, Boston. Decora-  
 tive Art.



FIRST FLOOR SOUTHWICK HALL

# Calendar

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## 1902

Entrance examination for day students, Thursday, Sept. 25, at 10 A. M.

Entrance examinations for evening students, Thursday, Sept. 25, at 7 P. M.  
(for additional examinations for evening classes, see announcement)

School year begins (day) Tuesday, Sept. 30.

Evening school year begins Monday, October 20.

Thanks giving recess, Thursday, Nov. 27, to Saturday, Nov. 29, inclusive.

Christmas recess, Monday, Dec. 22 to Thursday, Jan. 1, 1903, inclusive.

## 1903

Semi-annual examinations, beginning Wednesday, January 21.

Second term begins Monday, February 2.

Annual examinations begin Wednesday, May 20.

Diplomas awarded Thursday, June 4.

First entrance examinations Thursday, June 4, at 10 A. M.

There will be no sessions of the school on Washington's Birthday or on  
Patriots' Day.





SECOND FLOOR SOUTHWICK HALL

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# The Lowell Textile School.

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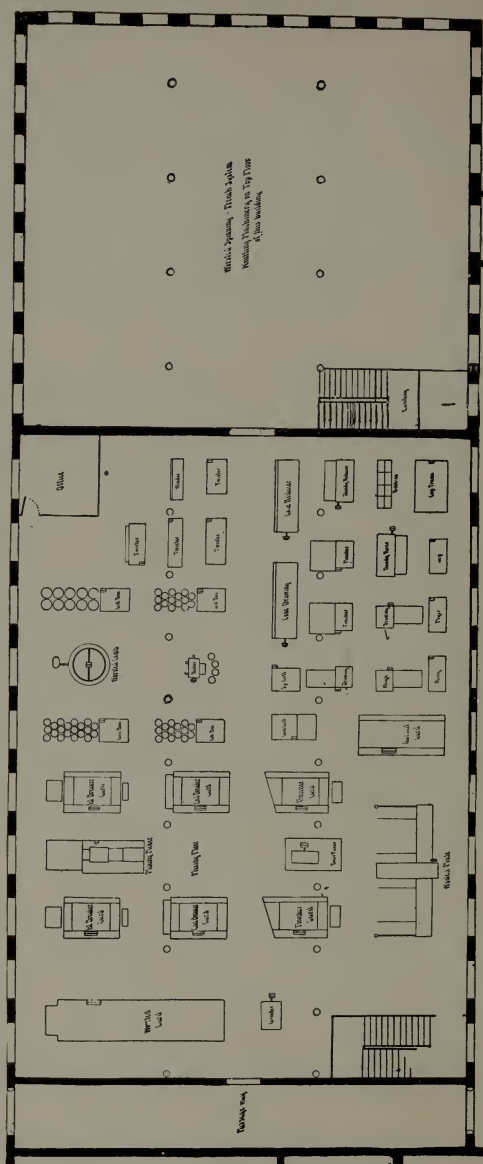
The establishing of a school at Lowell for thorough instruction in the theory and practical art of manufacturing all fibres known to the textile industry, although proposed early in 1891, was not determined upon until the organization, methods and scope of such foreign schools, especially in England, France, Switzerland, Germany and Russia, had been carefully studied, and their permanence and value to the textile interests of those countries made clearly apparent.

The "Trustees of the Lowell Textile School" are incorporated under a special act of the Massachusetts Legislature, "for the purpose of establishing and maintaining a Textile school for instruction in the theory and practical art of textile and kindred branches of industry."

The incorporators are mainly representatives either as president, treasurer, agent or superintendent, of the management of the great textile corporations of Lowell, Lawrence and vicinity in the Merrimack Valley with an aggregate capital of over \$65,000,000. By the terms of the By-Laws, at least three-fourths of the Trustees must be "persons actually engaged in or connected with textile or kindred manufactures." This insures the practical character of the management and instruction.

The School is located in Lowell, Massachusetts, the "Mother Textile City of America," the city and state affording financial aid, the manufacturers of New England being equally liberal in contributions. The advantages of the location at a textile centre where every commercial fibre enters into the products, the student thus being directly in touch with the textile industry and the management thereof, will be apparent.

The School was formally opened by His Excellency Gov. Wolcott on January 30, 1897, in the presence of a large gathering of gentlemen interested in textile industries from all parts of New England. Instruction was commenced on February 1, 1897, and the classes have been regularly conducted since that time with ever increasing attendance.



WOOLEN AND WORSTED SPINNING, FALMOUTH STREET BUILDING

As the larger percentage of the students in the regular day classes come directly from the high schools and academies, it has been found necessary to make the curriculum and instruction in the pure science branches especially in General Chemistry, Decorative Art and Mechanics as thorough as in the higher scientific institutions.

The principles of science and art are taught, not with the object of educating professional scientific men, but with a view to industrial and commercial application; but the School offers to graduates of universities and scientific institutions the advantage of technical instruction in the practical application of certain sciences. It also offers special facilities to those entering commercial life for obtaining such knowledge of the construction of textile fabrics and of the languages of foreign commerce as is essential in the marketing of goods abroad.

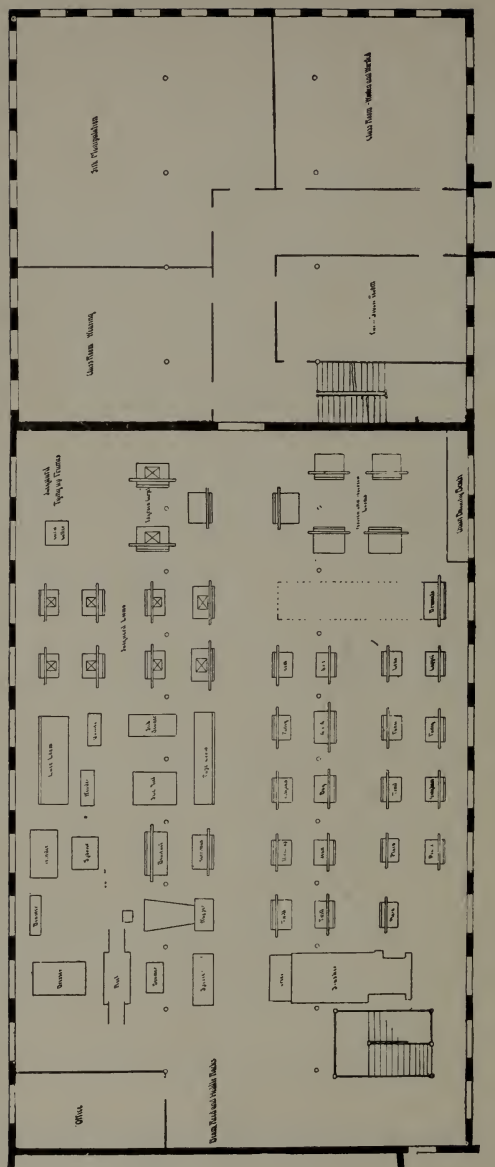
The equipment of the School consists of high grade machinery with all latest improvements, specially built to afford facilities for all kinds of experimental work, and of such variety as is never found in any one textile mill. With the machinery that is already installed, the School has a more varied equipment than any other existing textile school either in America or Europe, foreign schools being generally confined to instruction in the manipulation of one class of fibres only: namely, that used in the district where the school is located.

The lecturers and instructors are drawn from the leading scientific and art institutes of Europe and America, including those who have had special experience in textile school work and in the various processes of textile manufacture, the purpose of the management having been from the first to furnish as thorough scientific instruction in textiles and textile machine manufacture, as is furnished by any technological institution in the branches of industry to which it relates.

### **Day Classes.**

These are especially intended for the instruction of those whose intention it is to enter the business of textile manufacturing





POWER WEAVE ROOM, FALMOUTH STREET BUILDING

in any branch. The courses are sufficiently complete to enable one to start without any previous acquaintance with textiles ; but at the same time those who have been engaged in such business and wish to improve their knowledge and opportunities, can devote their entire time to study most profitably.

The complete collection of machinery enables every process to be practically illustrated.

The student has the option of selecting any one of five regular courses.

Each course is intended to cover three years. It is optional whether or not a student continues the full course of three years, but this is strongly recommended.

There is *one term* of preliminary instruction, which is common to all courses. At the end of this term, each student is required to select which of the courses he is to follow in his subsequent studies, and the instruction to be given after the first term of the first year is specialized to suit each course.

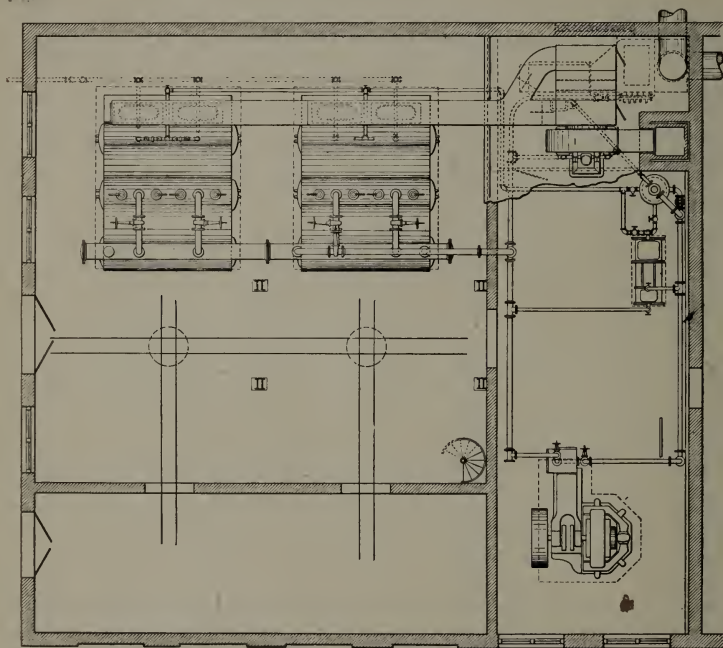
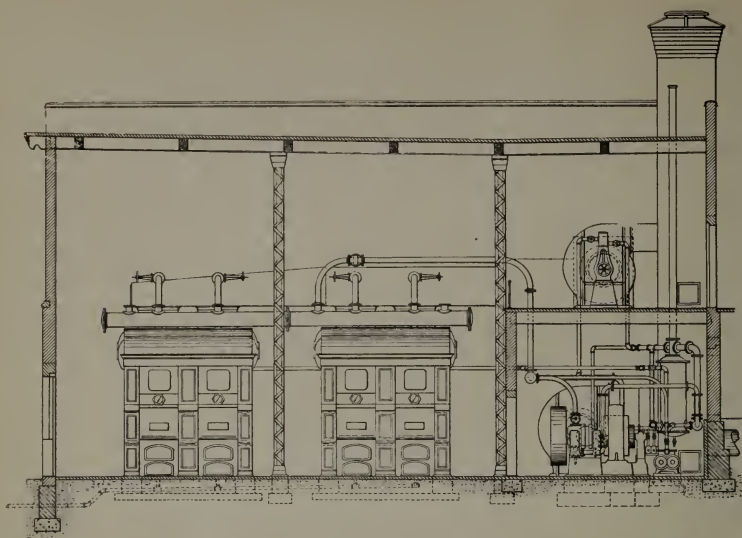
The five regular diploma courses are:

- I. Cotton Manufacturing.
- II. Wool Manufacturing.
- III. Designing. General Course.
- IV. Chemistry and Dyeing.
- V. Weaving.

#### **Evening Classes.**

The second branch of the school work is intended to give thorough evening instruction to those who are engaged during the day in mills and work shops, to enable those who wish it, to perfect their knowledge of the branches in which they work, to acquire knowledge of other processes than those in which they are regularly engaged, and in the course of several winters to complete a thorough technical education without interfering with their daily duties.

Evening students have the option of entering for one or more of six different courses, and arrangements will be made as far as possible for them to take such a section of each course as is suited to the student's daily occupation in the mill.



ARRANGEMENT OF STEAM HEATING AND LIGHTING PLANT  
IN BOILER HOUSE.

LOWELL TEXTILE SCHOOL - LOWELL - MASS -

- I. Cotton Spinning.
- II. (a) Woolen Spinning. (b) Worsted Spinning.
- III. Designing.
- IV. Chemistry and Dyeing.
- V. Weaving.
- VI. Mechanical Engineering.

Course IV requires four years, courses I, III and V require three years each ; courses II (b) and VI two years, and course II (a) one year.

For the satisfactory completion of either of these courses, the certificate of the school will be awarded ; the diploma of the school will be awarded in exchange for certificates of satisfactory completion of those subjects which go to make up any one of the several regular diploma courses.

In general it is possible to take up the study of two of the above evening courses concurrently.

The time devoted to practical work both day and evening is considerably longer than that devoted to lectures, and in order to make the instruction real and thorough, no student is allowed to pass to another machine or process until he becomes thoroughly acquainted with the one on which he is engaged.

#### **Women's Department.**

Among the many fields in which woman has entered, none has been found in which her natural refinements of taste and skill can be used to better advantage than in designing ; but natural ability though the prime requisite, is by no means all, for a certain amount of technical knowledge must be gained to achieve success. This department combines decorative art and textile design, and in general requires attendance on four afternoons per week.

#### **Commercial Department.**

A special course in textile construction and foreign languages is arranged for those contemplating a commercial career.

All such are invited to communicate with the principal, since there is demanded in such a course a greater variety of combinations of studies than in the manufacturing courses.



RAILWAY HEAD, DRAWING  
FRAME, AND COME



### **New Buildings.**

Since the issue of the 1901-1902 Catalogue, the School has received two additional gifts from Frederick Fanning Ayer, Esq. of New York City, one of \$35,000, the other of \$30,000 making \$100,000 in all from Mr. Ayer. The Commonwealth of Massachusetts has contributed \$35,000 more, making \$70,000 in all or a total of \$170,000 to be invested in a site for a permanent home for the School and for the construction of Southwick Hall, also \$21,000 from Charlotte P. Kitson, Emma K. Stott and the Kitson Machine Co., of Lowell, Mass., for the construction of Kitson Hall in memory of RICHARD KITSON, the founder of the Kitson Machine Co. A location on the shore of the Merrimack River just below the famous Pawtucket Falls has been secured, and Southwick Hall, named for Mr. Ayer's grandfather, will be ready for occupancy at the opening of the fall term October, 1902, as will also Kitson Hall, 60 by 200 feet, for cotton yarn making and the Falmouth Street Building of two floors, each 75 x 120 ft., one for weaving and the other for woolen and worsted spinning. The Locks and Canals Company, which controls the water power of the Merrimack River, has contributed 79,000 sq. ft. of land lying between the school and the river, and an additional lot has been secured on the other side making an aggregate of over eight acres.

### **Equipments.**

The equipment of machinery is the most varied in the world for textile educational purposes ; the machinery and plant already in place is of a value of \$300,000, and is such as to enable all commercial fibres to be treated in the School at every process until they become a woven fabric.

*NOTE:—The list of machinery is that on hand at the time of moving and does not include the new machinery to be installed.*

### **The Equipment of The Cotton Spinning Department includes:**

One process system of Kitson Picking Machinery from works of Kitson Machine Co., Lowell, Mass., as follows:

One Number Seven Opener with Automatic Feeder connected by Robinson Pat. Cleaning Trunk to

One 40" one Beater Breaker Lapper with Condenser and Gauge Box Feed.



One 40" one Beater Intermediate Finisher Lapper with Perham & Davis Sectional Plate Evener, apron to double four laps.

One 40" one Beater Finisher Lapper with Perham & Davis Sectional Plate Evener, apron to double four times, Kirschner Pat. Carding Beater.

One Roving Waste Opener.

One Thread Extractor.

One Top Flat Card, made by the Lowell Machine Shop, Lowell, Mass.

One Revolving Flat Card, made by the Lowell Machine Shop, Lowell, Mass.

Card Grinding Rolls, Stripping Rolls, etc.

One Sliver Lap Machine, made by the Mason Machine Works Taunton, Mass.

One Comb, made by the Mason Machine Works, Taunton, Mass.

One Railway Head, made by the Lowell Machine Shop, Lowell, Mass.

One Drawing Frame, made by the Lowell Machine Shop, Lowell, Mass.

One Slubber, made by the Lowell Machine Shop, Lowell, Mass.

One Intermediate, made by the Lowell Machine Shop, Lowell, Mass.

One Fine Frame, made by the Lowell Machine Shop, Lowell, Mass.

One Ring Spinning Frame, made by the Lowell Machine Shop, Lowell, Mass.

One Spinning Mule, made by the Lowell Machine Shop, Lowell, Mass.

One Spooler, made by the Lowell Machine Shop, Lowell, Mass.

Wet and Dry Twister, made by the Draper Co., Hopedale, Mass.

One Reel, made by the Whitin Machine Works, Whitinsville, Mass.

One 50 Saw Pratt Gin.

One Prior Roller Gin.

### **The Woolen Spinning Department Includes:**

One Parkhurst Burr Picker, made by the Atlas Mfg. Co. Newark, N. J.

One Mixing Picker, made by the Davis & Furber Machine Co., North Andover, Mass.

One set of three Woolen Cards, including :

First Breaker, made by the Davis & Furber Machine Co., North Andover, Mass.

Second Breaker, made by the Davis & Furber Machine Co., North Andover, Mass.

Finisher, made by the Davis & Furber Machine Co., North Andover, Mass.

One Improved Mixing Picker Feed, made by G. S. Harwood & Sons, Boston, Mass.

One Bramwell First Breaker Feed, made by G. S. Harwood & Sons, Boston, Mass.

One Torrance Balling Head and Creel, made by the Torrance Mfg. Co., Harrison, N. J.

One Apperly Feed, made by G. S. Harwood & Sons, Boston, Mass.

One Spinning Mule, 120 spindles, made by the Davis & Furber Machine Co., North Andover, Mass.

One Twister, made by the Davis & Furber Machine Co., North Andover, Mass.

One Roy Grinding Frame, made by B. S. Roy, Worcester, Mass.

One Roy Traverse Grinder, made by B. S. Roy, Worcester, Mass.

### **The Worsted Spinning Department Includes:**

One 50-inch Double Worsted Card (4 lickerin), made by the Davis & Furber Machine Co., North Andover, Mass.

From Hall & Stell, Keighley, England :

One Gill Box, before combing.

One Gill Box after combing.

From Crompton & Knowles, Worcester, Mass.:

One Noble Worsted Comb.

One Balling Box.

The following made by Prince, Smith & Son, Keighley, England :

- One Revolving Creel for 12 Balls.
- One Double Head Can Gill Box.
- One 2 Spindle Gill Box.
- One 2 Spindle Drawing Box.
- One 2 Spindle Weigh Box.
- One 4 Spindle Finisher.
- One 12 Spindle Dandy Rover.
- One 12 Spindle Cap Spinner.
- One 12 Spindle Flyer Spinner.
- One 12 Spindle Ring Spinner.
- One 12 Spindle 2 Fold Cap Twister.
- One 12 Spindle 6 Fold Ring Twister.

From Universal Winder Co., Providence, R. I. :

- One 6 Head Universal Winder, for Cones and Tubes.

#### **The Cotton Warp Preparation Department**

##### **Includes :**

- One Spooler, made by the Lowell Machine Shop, Lowell, Mass.
- One Warper, made by the Lowell Machine Shop, Lowell, Mass.
- One Slasher, made by the Lowell Machine Shop, Lowell, Mass.
- One Beamer, made by T. C. Entwistle, Lowell, Mass.
- One Winder, made by Altemus & Co., Philadelphia, Pa.
- Drawing-in Frames, etc.

#### **The Woolen and Worsted Warp Preparation Department**

##### **Includes :**

One Warp Spooler, made by the Davis & Furber Machine Co., North Andover, Mass.

One Dresser, made by the Davis & Furber Machine Co., North Andover, Mass.

One Reel, made by the Davis & Furber Machine Co., North Andover, Mass.

One Beamer, made by the Davis & Furber Machine Co., North Andover, Mass.

One 48 Spool Creel, made by the Davis & Furber Machine Co., North Andover, Mass.

Also a number of hand warping and beaming frames.

### **The Power Weaving Department,**

which is the most complete in the world, with regard to the variety of looms, includes:

One plain Northrop Loom, made by the Draper Co., Hopedale, Mass.

One Plain Print Cloth Loom, made by the Whitin Machine Works, Whitinsville, Mass.

One Side Cam Twill Loom, made by the Whitin Machine Works, Whitinsville, Mass.

One Five Harness Sateen Loom, made by the Lowell Machine Shop, Lowell, Mass.

One Plain Print Cloth Loom, made by the Mason Machine Works, Taunton, Mass.

One Harriman Automatic Shuttle Changing Loom.

And the following looms made by the Crompton-Knowles Loom Works, Worcester, Mass., and Providence, R. I.

One Model Dobby Attachments.

One Knowles Gingham Loom, 4 boxes.

One Knowles Fancy Cotton Loom, with 20 harness dobbie, 4 boxes.

One Knowles Fancy Cotton Loom, with 25 harness dobbie.

One Knowles Blanket Loom, with 25 harness dobbie, 4 boxes,

One Knowles Gem Loom, 20 harness, 4x4 boxes.

One Knowles Worsted Loom, 32 harness 4x4 boxes.

One Knowles Fancy Loom, with single lift jacquard.

One Knowles Fancy Loom, with double lift jacquard.

One Knowles Fancy Loom, with jacquard tied up for leno.

One 1200 Hook Halton Jacquard Head Motion, arranged to be transferred to different looms.

One Knowles Ingrain Carpet Loom, 4x4 boxes.

One Crompton Gingham Loom, 4x1 boxes.

One Crompton Fancy Loom, 6x1, with double cylinder 20 harness dobbie.

One Crompton Fancy Cotton Loom, with single cylinder 20 harness dobbie.

One Crompton Jean Loom.

One Crompton Lappet Loom, with 16 harness dobby.  
One Crompton Towel Loom, 2x1 boxes.  
One Crompton Ingrain Carpet Loom, 4x4 boxes.  
One Crompton Worsted Loom, 27 harness.  
One Crompton Worsted Loom, 24 harness, 4x4 boxes.  
One Crompton & Knowles Heavy Loom, 20 harness 4x4 boxes.

One Lewiston Machine Co. Loom, 4 harness, side cam.

One Lewiston Machine Co., Bag Loom.

There are also the following hand looms, viz. :

Twelve Hand Looms, 2x3 boxes, with 20 harness dobby

Eight Hand Looms, 4x4 boxes, with 24 harness dobby.

Six Hand Looms, 3x3 boxes, with 32 harness dobby.

Six Hand Looms, 4x4 boxes, with 30 harness dobby.

Two Hand Looms, with treadles.

Two Hand Looms, 4x4 boxes, with 200 hook jacquard.

Two Hand Looms, 3x3 boxes, 200 hook jacquard.

Two Hand Looms, 3x3 boxes, with 600 hook jacquard.

One Jacquard piano card cutting machine, from John Royle & Sons, Paterson, N. J.

#### **The Silk Machinery Consists of:**

One Winder, made by the Atwood Machine Co., Stonington, Conn.

One Quiller, made by the Atwood Machine Co., Stonington, Conn.

One Warper, made by the Atwood Machine Co., Stonington, Conn.

One Beamer, made by the Atwood Machine Co., Stonington, Conn.

One Doubling Frame, made by the Atwood Machine Co., Stonington, Conn.

### **The Dyeing Department**

is fully equipped with complete chemical laboratory with individual benches, also small machines for dyeing, and other processes.

Calico printing machine, made by Mather & Platt, Oldham, England.

One hydro-extractor, from W. H. Tolhurst & Sons, Troy, N.Y.

One jig dyeing machine.

One jacketed iron steaming chamber, from A. Edmeston & Son, Salford, England.

One drying chamber.

One ageing chamber.

One set steam jacketed copper kettles, evaporating benches, etc.

The School is well equipped with reels, balances, electrolytic and other scientific instruments for experimental purposes.

### **Knitting Department.**

One Mayo automatic seamless knitting machine.

One spring needle cut hose machine.

One latch needle ribbed hose machine.

### **Finishing Department.**

One Rodney Hunt fulling mill.

One string washer.

Hydro extractor.

Tenter bars, driers, etc.

One wire napper.

Gig.

One double shear, from Parks & Woolson Machine Co.

Press.

Steam brush.



### **Motive Power, Etc.**

One 30 horse-power motor, by the General Electric Co., Schenectady, N. Y.

Two 20 horse-power motors, made by the Westinghouse Electric and Manufacturing Co., Pittsburg, Pa.

One 2½ horse-power motor, made by N. E. Motor Co., Lowell, Mass.

One 1 horse-power motor.

One ½ horse-power motor.

One complete system of fire protection, including sprinklers, air pressure system, thermostats, and other appliances, by the General Fire Extinguisher Co., Providence, R. I.

One complete humidifying plant, by the American Drosophore Co., Boston, Mass.

One complete humidifying plant, by the U. S. Aerophor Air Moistening and Ventilating Co., Providence, R. I.

### **Boiler House.**

Two 100 H. P. Sterling Boilers.

One Sturtevant Induced Draft Apparatus.

One Sturtevant Smoke Consuming Apparatus.

One Boiler Feed Pump.

One Inspirator.

One Sturtevant Fan and Heater to warm Kitson Hall and Falmouth Street Building.

NOTE: Southwick Hall is warmed by a Sturtevant Apparatus, designed to provide the proper amount of fresh, warm air, as called for by the State Laws as applied to Educational institutions.

# Day Students.

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## Entrance Qualifications.

Candidates for admission to the day classes may present to the Principal such evidence as may be obtainable, whether degree, diploma or certificate, at any time. For all others, there will be held examinations, as stated in calendar; candidates failing to pass at June examinations will be allowed to try again in September; those who cannot attend the June examinations, may present themselves in September; if conditioned, a further examination will be appointed. Preparation in general will be as follows:

### Arithmetic.

Definitions; elementary operations in addition, subtraction, multiplication and division; squares; cubes; square root; interest, discount; fractions, simple and complex; decimals; percentage; ratio and proportion. Metric System.

### English.

The candidates will be expected to correct examples of bad English, both for spelling, punctuation, capitalization, grammar and sense; also to write a short composition on a given theme (some familiar one) to show a knowledge of language and method of expression.

### Geography.

Location of principal countries, with capitals, large rivers, mountains, etc.; noting characteristics of climate, productions and inhabitants. General statements rather than specialization will be sought.

## **Algebra.**

If conditioned this subject may be passed off during the term.

Definitions ; fundamental operations, parentheses ; factoring ; highest common factor ; least common multiple ; fractions, simple and complex ; simple equations, one or more unknown quantities ; involution and evolution ; square and cube root ; logarithms.

## **Application Blanks.**

A blank form of application may be found at the end of this book.

## **Bulletins and Catalogue.**

All students registering and paying the regular fee for the course selected will be entitled to the Bulletins and Catalogue when issued.

Sample copies may be had on application to the Principal.



### **Preparatory School.**

For those who intend to take Chemistry and Dyeing, physics is almost indispensable; and while the preparation afforded by the modern grammar school will enable the student to complete either of the courses at this school, the increased advantages of the equivalent of a high school training cannot be over-estimated. In such a preparatory course, particular attention should be given to algebra, geometry, manual training, chemistry, physics (including mechanics, heat, light and electricity), French and German.

### **Optional Courses.**

During the present year optional courses are offered in advanced algebra, German, Spanish and French.

It will be noticed in the regular courses several options are given.

### **Advanced Standing.**

Candidates who may have received previous training in any of the subjects ordinarily taken in the regular courses may present themselves for examination in such a subject on Friday, September 26, 1902. If a satisfactory rank be attained, they will be given such further work as will be best suited to their advancement.

### **Fees.**

The fee for the day course is \$100 per year for residents of Massachusetts; for non-residents it is \$150 per year.

Five-eighths of the fee is payable on or before Oct. 10, the balance on or before Feb. 10, of each year. After payment is made, no fee or part thereof can be returned, except by special action of the Trustees.

Special students pay in general, the full fee, but if a course be taken involving attendance at the school during a limited time, application may be made to the Principal for a reduction.

Students must provide their own books, stationery, tools, etc., and pay for any breakage or damage that they cause. The above fee includes free admission to any of the evening classes in which there is accommodation should any day student desire to attend.

A deposit of \$15 will be required to cover the cost of breakage in the chemical laboratory, the unexpended balance to be returned to the student at the end of the year.

The fees for the evening classes vary and are indicated elsewhere.

Fees are strictly payable in advance, and no student will be admitted to the classes until his fees are paid and he has filed an attendance card.

### **Examinations.**

Examinations will be held at the end of each term.

Students who do not show sufficiently satisfactory progress in the final examinations at the end of the first year will not be admitted to the second year classes, and the same applies to second year students with reference to their admission to the third year classes.

Intermediate examinations will be held, which will serve to inform the student as to progress made, or lack of it, and may be appointed at any time.

In general, the examinations will cover the work of the preceding term, but at the end of the third year, candidates for diplomas may be examined on all preceding work.

Daily work and regularity of attendance will also be considered in making up the reports of standing.

### **Reports of Standing**

Twice during each term informal reports are sent to students, or to guardians of such as are not of age; and at the end of each term formal reports are made.

### **Attendance Card.**

At the beginning of each term all students must fill out and file with the Principal on blank forms which are provided, a formal application for such subjects as he may choose, subject to the approval of the Principal. When an attendance card is once approved, no change can be made except through the Principal.

### **Thesis.**

All candidates for the diploma of the school must file with the Principal not later than May 15, a report of original investigation, or research, written on a good quality of paper, 8x10 inches, with one inch margin at left, and  $\frac{1}{2}$  inch at right of each page; such thesis to have been previously approved by the head of the department in which it is made.

### **Graduate Course.**

Graduates of technical courses of other schools are invited to communicate with the Principal with reference to special courses in the textile studies. Previous training in the engineering branches will usually reduce materially the time necessary to complete either of the courses at this school. The advantages offered to such persons for special research work are unexcelled, and a most profitable course may be arranged.

### **Diploma.**

The diploma of the School is awarded upon the satisfactory completion of either of the five regular courses, covering not less than three years, except where entrance is to advance standing. In such cases at least one year's residence will be required.

### **Certificate.**

For the satisfactory completion of a three years' course in any special department, the certificate of the School will be awarded; it is possible to complete such a course in less than three years, if the candidate be passed to advanced standing, but at least one year's attendance will be required.

### **Payments.**

All payments should be made to Wm. W. Crosby, Principal. If by check, remittance from points outside of New England should be in Boston funds.



### **Medal of Honor.**

The New England Cotton Manufacturers' Association offers annually a medal to that member of the graduating class who shall be selected by a committee of the Association as best fitted to receive it.

### **Conduct.**

Day students will be expected to attend all lectures, classes and demonstrations of practical work, except when permission to be absent has been obtained from the Principal. In cases of sickness, or other unavoidable absence, written explanation must be sent to the Principal.

Books will be prescribed for study and for entry of lecture notes and other exercises, and will be periodically examined by the lecturers. The care and accuracy with which these books are kept will be considered in determining standing.

Students are required to return to the proper place all instruments or apparatus used in experimental work and to leave all machinery and apparatus with which they may experiment clean and in working order.

In the cases of either day or evening students, irregular attendance, lack of punctuality, neglect of either school or home work, disorderly or ungentlemanly conduct, or general insubordination, will be considered good and sufficient reason for the suspension of a student by the Principal, and for his subsequent removal from the School and forfeiture of all school privileges, if the President of the School so decides.

Apparatus used in the Dyeing or Chemical Laboratory will be provided by the School, but a deposit must be made by the student at the beginning of the term sufficient to cover its cost, and this deposit will be returned to him at the close of the term, subject to such deduction as will reimburse the School for broken or damaged articles.

### **Library.**

The School Library is supplied with all the leading textile books and with works dealing with science, art or industries allied to the textile trades. The leading textile trade papers are kept on file.

### **Sessions.**

The regular school sessions will be in general from 9 A. M. till 1 P. M., and from 2.15 to 5 P. M., except Saturdays, when the buildings will be closed in the afternoon.

A schedule will be prepared showing the time to be devoted to each subject and the hours at which the various classes meet. This will be rigidly adhered to and the register will be marked for each lecture or demonstration.

### **General.**

Students from a distance, requiring rooms and board in the city, may, if they desire it, select the same from a list which is kept at the School. The cost of rooms and board in a good district is from \$4 per week upwards.

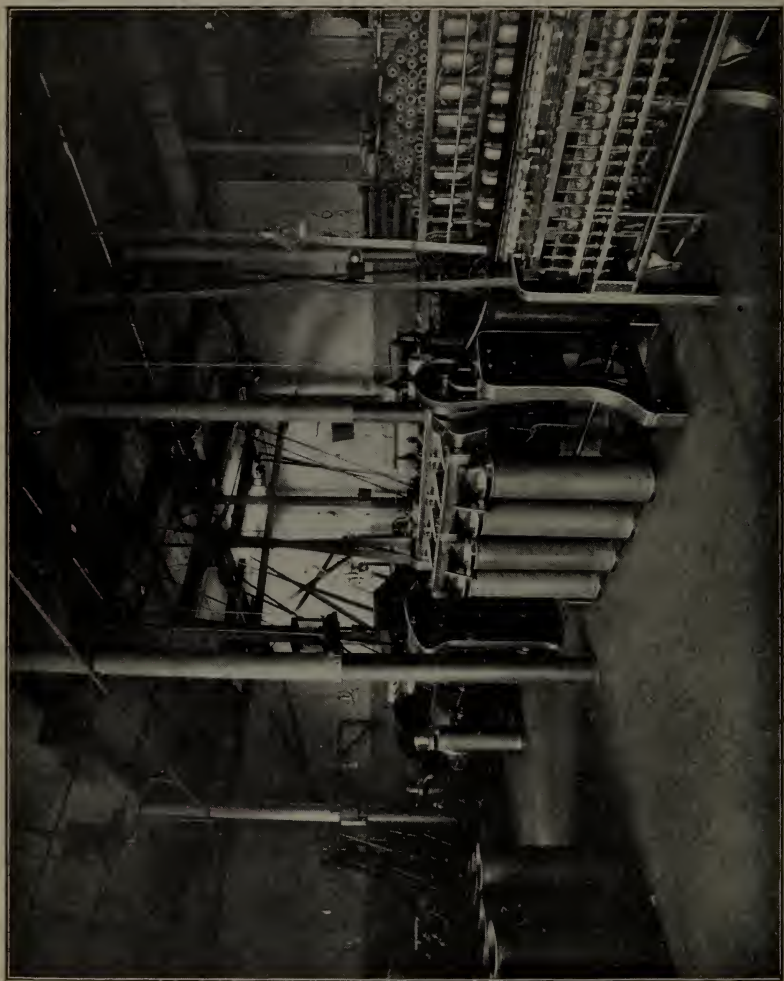
All raw stock and yarn will be provided by the School and all the productions of the School remain, or become, the property of the Trustees, except by special arrangement, but each student will be allowed to retain specimens of yarn or fabrics that he has produced, if mounted and tabulated as prescribed by the Principal, and facilities will be given for the preparation of a collection of such fabrics as are produced in the School, with all the instruction for their manufacture. It is understood that the Trustees may retain in the School such other specimens of student's work as the Principal may determine.

Prospective students who are desirous of arranging special courses by omitting a portion of one course, adding a portion of another, or in any other way are invited to communicate with the Principal.

An additional entrance examination to suit the convenience of students from a distance (out of New England), will be arranged.

Lock boxes will be provided for the use of students, sufficiently capacious to contain clothing, books and tools. A deposit of 25 cents will be required, which will be returned to the student upon the surrender of the locker key.

No books, instruments or other property of the School will be loaned to the students, or allowed to be removed from the premises.



RING AND  
DRAWING FRAMES

Facilities will be given for visits by day students to New England mills and works during the session.

### **Materials.**

Students must purchase such tools, instruments, text books and apparatus as may from time to time be recommended by the head of each department, and the cost of these for day students will be from \$10.00 to \$15.00, and for evening students from \$1.00 upwards, according to the subject studied.

### **The Regular Courses.**

The title of each of the regular courses is an indication of the particular nature of the course, unless it be in the case of Course III. There is a considerable demand for a general textile course in which the whole subject may be treated broadly ; this course is organized with this particular object in view, although various options are offered, in which some one branch may be followed at length.

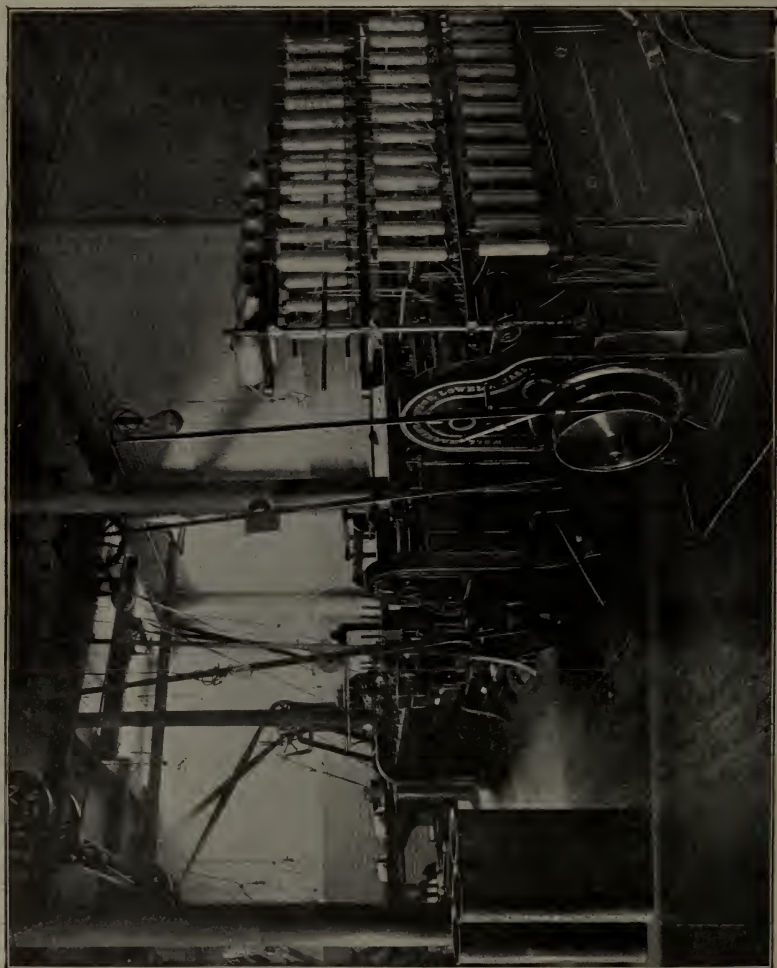
Certain general studies are included in each course, in order that in specializing a too narrow view may be avoided ; for in this branch of the world's industries, there have been too many short sighted policies in the past, and it is to be hoped that the broadening influence of the textile school may help to usher in a new era.

### **Special Courses.**

While it is always urged that regular courses be followed if possible, there is opportunity to make special arrangements to fit for particular positions, as for example :—yarn mill, weaving special fabrics, designing, etc., and owing, to the large number of possibilities, those desiring such courses are invited to correspond with the Principal. See paragraph "Certificate," p. 35.

### **Awards.**

Gold Medal Paris Exposition, 1900, for general excellence. A special Medal Merchants and Manufacturers Exhibition, Boston, 1900. The Pan American Medal awarded to the School, 1901.



FLY FRAMES



# Courses of Instruction.

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## DAY CLASSES.

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(For details of the several subjects see subsequent pages, beginning with page 46.)

### FIRST YEAR — FIRST TERM.

*(Common to all courses.)*

Design Construction.	Cloth Construction.
Cloth Analysis.	Hand Looms.
Elements of Mechanism.	General Chemistry.
Mechanical Drawing.	Freehand Drawing.

Options:

French, German, Spanish.

### Course I. — Cotton Manufacturing.

#### FIRST YEAR — FIRST TERM.

*(Common to all courses, see above.)*

#### FIRST YEAR — SECOND TERM.

Cotton Fibre.	Cotton Manipulation.
Microscopic Examination of Fibre.	Cloth Construction.
Design Construction.	Hand Looms.
Cloth Analysis.	General Chemistry.
Elements of Mechanism.	Freehand Drawing.
Mechanical Drawing.	

Options:

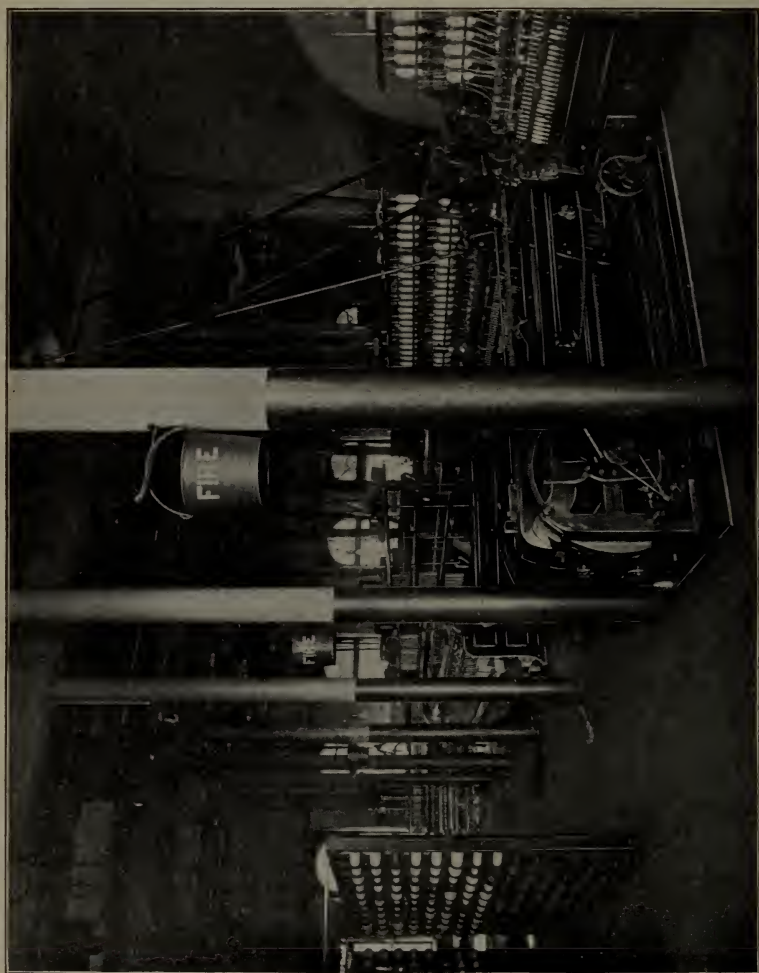
French, German, Spanish.

#### SECOND YEAR — FIRST TERM.

Cotton Manipulation.	Applied Mechanics.
Machine Drawing.	Warp Preparation.
Textile Chemistry and Dyeing.	Weaving.
Designing.	Cloth Analysis.

#### SECOND YEAR — SECOND TERM.





COTTON MULE

Cotton Manipulation.  
Machine Drawing.  
Textile Chemistry and Dyeing.  
Cloth Analysis.

Applied Mechanics.  
Weaving.  
Designing.  
Electricity.

THIRD YEAR.

Cotton Manipulation.  
Weaving.  
Knitting Machinery.

Designing.  
Mill Engineering.  
Thesis.

**Course II. — Wool Manufacturing.**

FIRST YEAR — FIRST TERM.

*(Common to all courses, see page 41.)*

FIRST YEAR — SECOND TERM.

Wool Fibre.

Woolen Spinning.  
Microscopic Examination of Fibres.

Design Construction.

Cloth Construction.

Cloth Analysis.

Hand Looms.

Elements of Mechanism.

General Chemistry.

Mechanical Drawing.

Freehand Drawing.

Options:

French, German, Spanish.

SECOND YEAR — FIRST TERM.

Woolen Spinning.

Applied Mechanics.

Machine Drawing.

Warp Preparation.

Weaving.

Designing.

Textile Chemistry and Dyeing.

Cloth Analysis.

SECOND YEAR — SECOND TERM.

Worsted Spinning.

Applied Mechanics.

Machine Drawing.

Weaving.

Textile Chemistry and Dyeing.

Designing.

Cloth Analysis.

Electricity.

THIRD YEAR.

Wool Manipulation.

Designing.

Weaving.

Mill Engineering.

Knitting Machinery.

Thesis.

### Course III. — Designing.

#### FIRST YEAR — FIRST TERM.

(Common to all courses, see page 41.)

#### FIRST YEAR — SECOND TERM.

Design Construction.	Cloth Construction.
Cloth Analysis.	Hand Looms.
Design Sketching.	Freehand Drawing.
Mechanical Drawing.	General Chemistry.
Elements of Mechanism.	

#### Options:

Woolen and Worsted Spinning.	Cotton Spinning.
French, German, Spanish.	

#### SECOND YEAR.

Design Construction.	Cloth Construction.
Cloth Analysis.	Hand Looms.
Design Sketching and Jacquard Work.	
Decorative Art.	Weaving.
Textile Chemistry and Dyeing.	Applied Mechanics.

#### Options:

Woolen and Worsted Spinning.	Cotton Spinning.
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#### THIRD YEAR.

Designing.—Advanced Work.	Weaving.
Mill Engineering.	Thesis.
Decorative Art.	

#### Options:

Woolen and Worsted Spinning.
Cotton Spinning.

### Course IV. — Chemistry and Dyeing.

#### FIRST YEAR — FIRST TERM.

(Common to all courses, see page 41.)

#### FIRST YEAR — SECOND TERM.

General Chemistry.	Qualitative Analysis.
Stoichiometry.	Mechanical Drawing.
Elements of Mechanism.	Designing.
Cloth Analysis.	Hand Looms.
German.	

SECOND YEAR.

Textile Chemistry and Dyeing.	Advanced Inorganic Chemistry.
Chemical Philosophy.	Organic Chemistry.
Applied Mechanics.	Electricity.
	Options:
Designing.	Weaving.
	German.

THIRD YEAR.

Quantitative Analysis.	Industrial Chemistry.
	Advanced Textile Chemistry and Dyeing.
Dye Testing.	Microscopy.
	Thesis.
	Options:
Weaving.	Mill Engineering.

**Course V.—Weaving.**

FIRST YEAR—FIRST TERM.

*(Common to all courses, see page 41.)*

FIRST YEAR—SECOND TERM.

Design Construction.	Cloth Construction.
Cloth Analysis.	Hand Looms.
Freehand Drawing.	Mechanical Drawing.
Elements of Mechanism.	General Chemistry.
	Options:
Woolen and Worsted Spinning.	Cotton Spinning.
	French, German, Spanish.

SECOND YEAR.

Design Construction.	Cloth Construction.
Cloth Analysis.	Hand Looms.
Decorative Art.	Loom Construction.
Textile Chemistry and Dyeing.	Weaving.
	Applied Mechanics.
	Options:
Woolen and Worsted Spinning.	Cotton Spinning.

THIRD YEAR.

Fabric Structure.	Cloth Construction.
Cloth Analysis.	Hand Looms.
	Analysis of Weaving Mechanism.
Weaving.	Thesis.
	Mill Engineering.

# Cotton Spinning Department.

## FIRST YEAR.

1. The Cotton Fibre.  
Cotton Selection.  
Classification of cotton.  
Varieties of cotton from different parts of the world.  
The Cotton Gin.  
Hand and Mechanical methods of mixing and distributing cotton from the bale.  
The construction of the Automatic Feeder.  
The construction of the Opener.  
The construction of the Breaker.  
The construction of the Intermediate and Finisher Lappers.  
The operation and care of Picking Machinery.  
Theory of Carding and Development of Carding Machinery.  
The Stationary Top Card.  
The Revolving Top Card.  
Principles of Roller Carding as applied to using short stock and waste.  
Card Grinding, Setting, Stripping and care of Cards.
2. Operation of above machines.
3. Calculations connected with the machines named above.

## SECOND YEAR.

1. Construction and use of the Railway Head.  
Principle of Drawing processes.  
Construction and care of the Drawing Frame.  
The development of the Fly Frame.  
The construction and use of the Slubbing Frame.  
The construction and use of the Intermediate Frame.  
The construction and use of the Fine Frame.  
The operation and care of Flyer Frames  
The construction and use of the Ring Spinning Frame.
2. Operation of above named machines.
3. Calculations connected with the above machines.

## THIRD YEAR.

Construction and use of the Cotton Comb.  
Construction and use of the Sliver Lap Machine.  
Construction and use of the Ribbon Lap Machine.  
The operation and care of Combing Machinery.  
The construction and use of the Mule.

Knitting.

Construction and operation of Web Machines, Rib Machines, Loop-ers, etc., in the production of plain hosiery.

2. List of machinery adapted for different purposes in Cotton Mill Work.

Layout of Machinery for different processes.

## Woolen and Worsted Spinning Department.

### WOOLEN SPINNING.

#### FIRST YEAR — SECOND TERM.

##### Lecture Course :

Animal and Vegetable Fibres.

Discussion of the various kinds of Wool and their Spinning qualities.  
Wool Sorting.

Manufacture and use of Shoddies, Mungoes, Extracts, Flocks and Noils.

Wool Washing, including the construction and uses of Washing Machines and Hydro-Extractors, and materials used as Detergents.

Carbonization, Wet and Dry Process.

The Solvent Process for Cleansing Wool.

Construction and uses of Dryers (Table and Artificial).

Shrinkage of Wool in Washing.

Construction and uses of the several kinds of Pickers, Burring and Garneting Machines.

Picking, Mixing, Blending and Oiling.

Kinds and quantities of Oil. Testing.

Principles of Carding.

Carding on the First Breaker, Second Breaker and Finisher.

Condensers.—Single and Double Doffers, etc.

Setting and uses of the various parts of the Card.

The various kinds of Feed.—Hand, Bramwell, Apperly, Camelback, Torrance Balling Head and Creel, etc.

Card Clothing.—Various kinds of Backing (Leather, Linen, Flexifort. etc). Kinds and sizes of Wire ; Garnet Wire.

Method of counting Card Clothing (counts and crowns).



Setting up Cards, turning up Cylinders, clothing the Card, Grinding. Speeds, Production, etc.

SECOND YEAR.—FIRST TERM.

Principles of Spinning.

History and development.

Hand Jack, Self-operating and Self-acting Mules.

The Mule-head.

Method of driving the various parts, Rolls, Spindles, Carriage, etc, Backing-off.

Winding Mechanism.

Study of the Quadrant and Builder-rail.

Regulation of the Fallers.

Double Spinning.

Twisting on Mule and on Woolen Twister.

With the above lectures will be given all the necessary calculations and actual practice on the various machines.

WORSTED SPINNING.

SECOND YEAR.—SECOND TERM.

Lecture course.

The difference between a Worsted and a Woolen Thread.

Carding.

Preparing.

What wools are prepared and why they are not Carded.

Doubling and Back Washing,—the nature of these processes.

The principles, history and development of Combing.

Combing on the Noble, Lister, Holden and Little & Eastwood Machines.

Pin Setting.

Gilling and Top Making.

The hygroscopic property of Wool.

Conditioning of Tops.

Principles of Drawing.

Construction of the Drawing and Roving Frames.

Drawing on the Open, Cone and French Systems.

Study of the Drag.

Stop Motions.

Construction and uses of Gauge Points.

Principles of Spinning.

Spinning on the Cap, Flyer and Ring Frames.

Worsted Mule Spinning.

Types of Frames (Leicester and Illingworth).

Spinning of Carpet, Braid and Botany yarns.

The system of counting Worsted yarns.

Doubling and Twisting, including the construction and uses of the various kinds of Twisters.

Winding, Hanking, Balling and Bundling.  
Yarn Testing, etc.

The above lectures include all the necessary calculations and actual practice on the various machines.

#### THIRD YEAR.

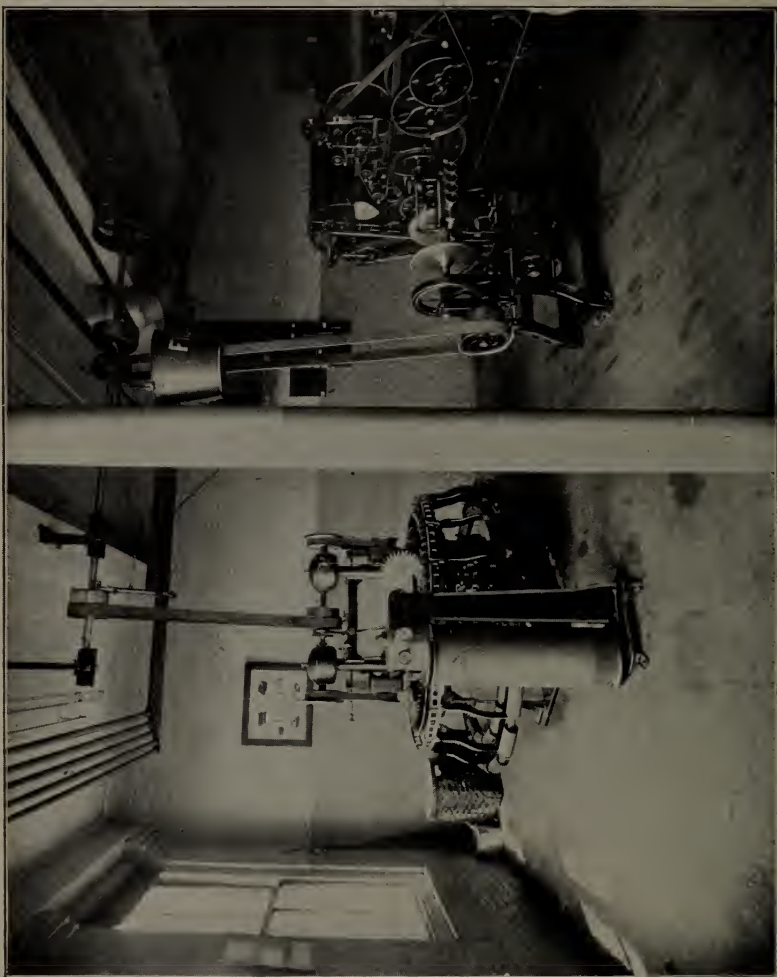
Manufacture of fancy yarns.  
Fancy mixed yarns.  
Woolen and Cotton.  
Woolen and Silk.  
Woolen and Worsted.  
Union yarns, (Worsted and Cotton).  
Two, three and more ply, fancy twists.  
Fancy knotted yarns, Knickerbocker, etc.  
Loop, Slub and Mottled yarns.  
Color as applied to fancy yarns.  
Layout of machinery for different processes.  
Humidifying and Humidifiers.  
Production and Costs.

## Designing Department.

### GENERAL COURSE.

#### FIRST YEAR.

1. Course of lectures on cloth construction and designing in Cotton, Woolen, Worsted, Silk, Linen, etc.  
Classifications of fabrics.  
Plain fabrics and fabrics on a plain cloth basis.  
Names and explanations of different parts of cloth and terms applied to weaves, etc. Point or design paper.  
Methods of representing weaves, drafts, etc., on paper.  
Explanation of harness and chain drafts.  
Twill cloth and combination of same.  
Broken twills.  
Sateens.  
Combination of weaves.  
Figured weaving on plain ground.  
Diapers, coatings, trouserings.  
Colored goods, stripes,  
Checked goods,
2. Practical work and lessons on cloth analysis and reproduction of fabrics, one on planning patterns, drafts, etc., on paper, including yarn and cloth calculations, as below.



WORSTED COMBS

3. Practical work on hand looms, putting into operation the principles taught in the foregoing course.

Yarn and cloth calculations.

4. The uses of textile calculations, methods of naming or counting. International System of counting yarns.

Comparative calculations for converting one system of yarns into that of another.

Calculations for folded or ply yarns.

Calculations to find weight, count or length of warp, from given data.

Calculations for reeds.

Calculations for harness, straight, centered, or pointed draft.

Calculations for harness, spaced and in combinations.

Calculations for shrinkage, or contraction.

Calculations for quantities of material to make plain and striped warps.

Calculations for quantities of material required to make plain and checked fabrics.

Calculations to find the number of ends per inch in order to use a given weight of warp, also picks per inch to use a given weight of filling.

Calculations on the proportioning of fabrics.

Practical lessons in color effects.

Combinations of colored threads.

Color definition.

Color nomenclature.

## SECOND YEAR.

### Lecture Course:

Construction of Cloth.

Balance of Cloth.

Cloth made with or ornamented by extra warp.

Cloth made with or ornamented by extra filling.

Double and Triple Cloths.

Cotton, Fancy Sateen Stripes.

Cotton Velvets.

Cotton Plushes.

Cotton Pile fabrics, cut and uncut.

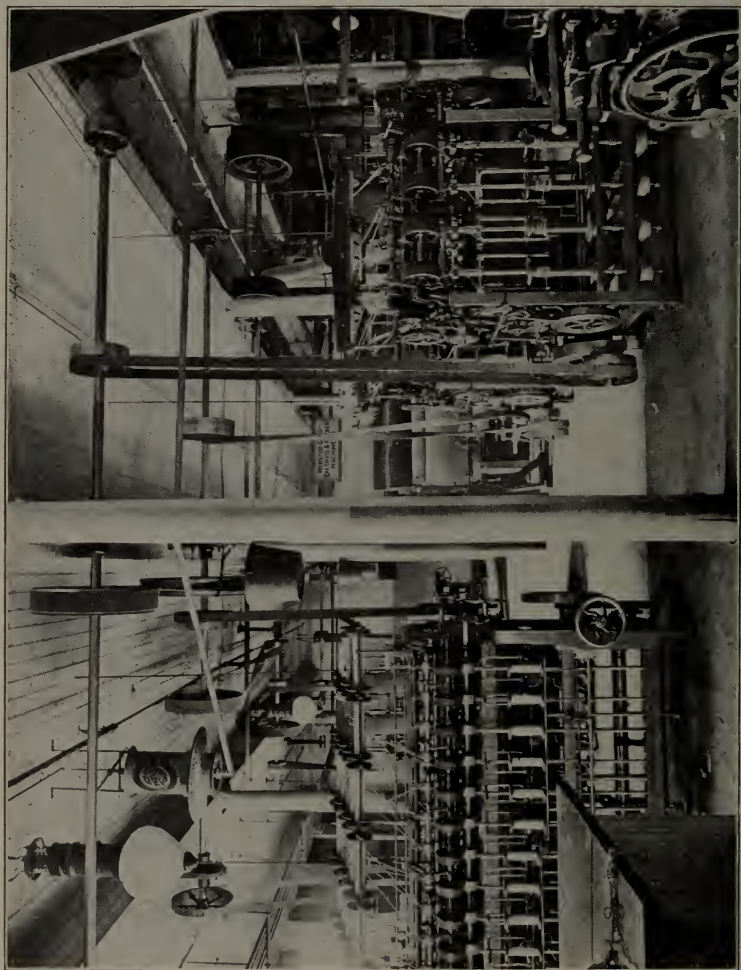
Color and color effects.

Color definition.

Color nomenclature.

Fancy Woolen Cassimeres.

Trouserings, Suitings and Coatings.



WORSTED DRAWING



Figured Matellasses.

Worsted and Mohair Mantle Cloths.

Figured Blankets.

Carriage Robes.

Shawls.

Figured double plain.

Reversibles.

Practical Work and lessons on cloth analysis and reproduction of fabrics, and on planning patterns, drafts, chains, etc., on paper, including all necessary calculations.

Amount of material required for laying out lots for mixes and twisted yarns.

Amount of material used in the construction of fabrics, analysis to consist of Cotton Dress Goods, Gingham and Fancy Weave Dress Goods.

Fancy Woolen and Worsted Cassimeres.

Woolen and Worsted Suitings.

Woolen and Worsted Tricots.

Overcoatings.

Double Cloth and Ingrain Carpets.

Practical work on hand looms, putting into operation the principles taught in the foregoing course.

#### THIRD YEAR.

Lecture course:

Cotton Gauze.

“ Leno.

“ Lappet.

Jacquard Designing.

Casting out.

Distribution of Patterns.

Determination of areas occupied by the figures.

Jacquard figures formed with warp.

Jacquard figures with filling.

Figures not square.

The principles of designing, cloth structure and coloring best adapted to each of the above fabrics.

Cloth formed by the combination of Jacquard gauze and fancy harness weaves.

Jacquard pile and ordinary weaves.

Special designs for Jacquard gauze, and pile fabrics.

Vestings, Golfings, Lappet.

Analysis.

The structure and analysis of all descriptions of compound fabrics viz:—backed, double, and various types of Jacquard figured fabrics, especially applicable to the Cotton and Worsted industries.





WOOLEN CARDS

Calculations necessary in determining the departmental and total cost of production of any fabric from given data of values of materials, labor, etc., by ascertaining the fibre, counts, threads, picks, weight, etc.

Hand and power loom practice, putting into operation the principles taught in the foregoing course.

## **Finishing.**

Examination of cloth from the loom. Perching, Knotting, Baling, Mending, etc.

Preparation of cloth for the Fulling Mill.

Flocking and its purpose.

Construction and use of the Soaping Machine.

Use of soaps and alkalies for fulling and scouring purposes.

Construction and use of various types of Fulling Mills and Stocks.

Theory and method of fulling various classes of goods.

Construction and use of various types of Washing Machines.

Theory and method of scouring cloth before and after fulling.

Hydro Extractors and their use.

Construction and use of various types of Napping Machines.

Construction of various types of Gigs.

Theory of Crabbing.

Construction and use of various Starching and Water Proofing apparatus

Construction and use of various types of Tentering and Drying Machines.

Construction and use of Single and Double Shears.

Construction and use of the Steam Brush.

Method of finishing various classes of Woolen and Worsted goods.

Cloth Examining, Measuring, Weighing, Ticketing, Numbering, Rolling, Baling, Casing and Shipping.

Construction and use of the various machines necessary for this purpose. Testing apparatus, etc.

All the necessary calculations for the various processes of finishing all classes of goods.

## **Chemistry and Dyeing Department.**

The regular course in Chemistry and Dyeing for day students extends through three entire school years, and is especially recommended to those who intend to enter any branch of textile coloring, bleaching, or the manufacture or sale of the various dyestuffs and chemicals used in the textile industry.

In addition to acquiring a thorough knowledge of the principles of all branches of dyeing, printing, bleaching, etc., the student by application, study, and conscientious performance of all the prescribed laboratory and



WOOLEN MULE

practical work, should become efficient in the subject of Textile Chemistry, and the methods of testing the various dyestuffs, mordants, etc.,

In this course the following subjects are presented :

### GENERAL CHEMISTRY

This subject is required of all students taking the regular course in Chemistry and Dyeing and all others intending to take up the study of Textile Chemistry and Dyeing later.

It will include lectures, recitations, and a large amount of individual laboratory work upon the following subjects, and will extend through one entire school year :—

#### *Chemical Philosophy.*

Chemical action, chemical combination, combining weights, atomic weights, chemical equations, acids, bases, salts, Avôgadro's law, molecular weights, formulas, valence, periodic law, etc.

#### *Non-Metallic Elements.*

Study of their occurrence, properties, metallurgy, chemical compounds, etc.

#### *Metallic Elements.*

Study of their occurrence, properties, metallurgy, chemical compounds, etc.,

#### *The Hydrocarbons and their derivatives.*

Study of their occurrence, properties, preparation, uses, etc.

#### *Qualitative Analysis.*

Before the completion of the course, the students will take up as thoroughly as the time will permit, the qualitative detection of the more common metals and non-metals, with practical work.

### QUALITATIVE ANALYSIS.

Qualitative Analysis will be studied by all regular students during the second term of the first year. The work will be based upon A. A. Noyes' Qualitative Chemical Analysis and will consist of one lecture, one recitation, and not less than five hours laboratory work per week. The student must become familiar with the separations and the detections of the common metals and acids by the analysis of a satisfactory number of solutions, salts, alloys, pigments, etc. At intervals during the term short laboratory tests will be given as well as the regular written examinations.





WORSTED CARD

No pains will be spared to make the course as valuable to the student as possible and to encourage only thorough and intelligent work.

Students taking Course IV will be required to work in the laboratory not less than twelve hours per week and when sufficiently advanced, will take up the examination of various products with which the textile chemist must be familiar, such as testing mordanted cloths, pigments, and the various dyeing reagents.

## STOICHIOMETRY.

This subject will be taken up by the chemistry and dyeing students during the second term of the first year. Special attention will be paid to the writing of the chemical equations, representing the chemical reactions involved in the qualitative analysis. The application of the metric system will be carefully studied; as well as the different thermometric and specific gravity scales; and problems will be worked by the students involving the expansion and contraction of glass, determination of percentage composition of chemical compounds, etc.

## TEXTILE CHEMISTRY AND DYEING.

Under this head is included first the lecture course in Textile Chemistry and Dyeing, which is taken by all regular diploma students, and second the laboratory and practical work course which will be taken by the regular Chemistry and Dyeing or Course IV students.

### OUTLINE OF LECTURE COURSE.

#### *Technology of Vegetable Fibers.*

Cotton, Linen, Jute, Hemp, China grass, etc. Chemical and physical properties, chemical composition, microscopical study, action of chemicals, acids, alkalies, heat, etc.

#### *Technology of Animal Fibres.*

Wool, Silk, etc. Chemical and physical properties, chemical composition, microscopical study, action of chemicals, acids, alkalies, heat, etc.

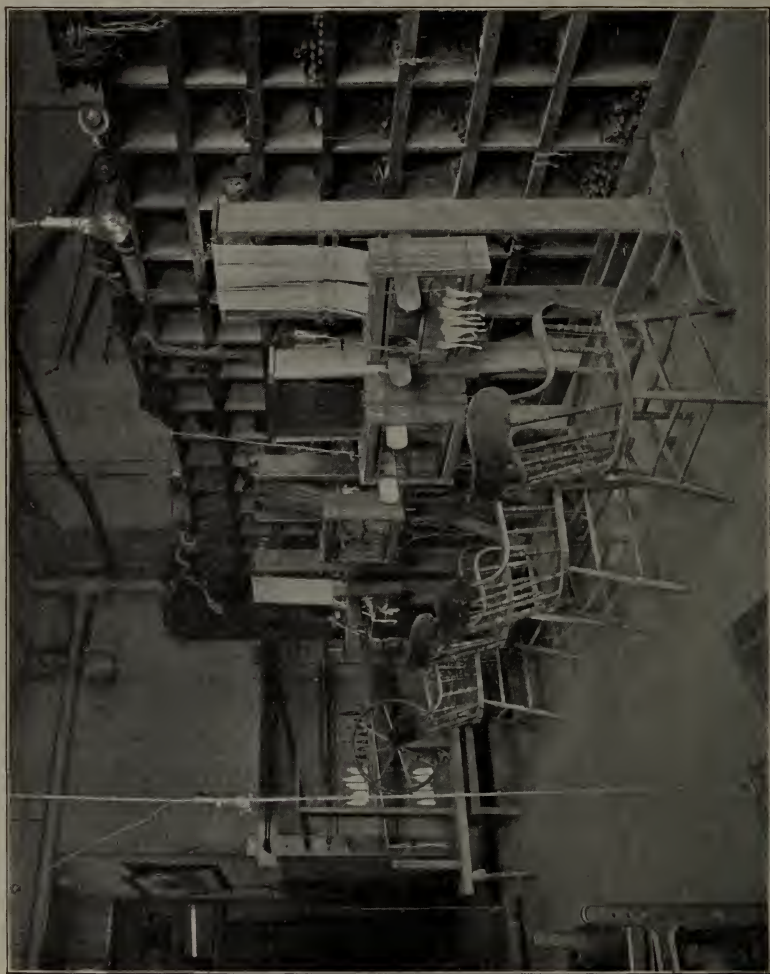
#### *Operations Preliminary to Dyeing.*

Bleaching of cotton and linen, wool scouring, bleaching, fulling and felting, silk scouring and bleaching, action of soaps.

#### *Water and its Application in the Textile Industry.*

Impurities present, the methods of their detection, their effect during different operations, and methods for their removal or correction.





DRAWING IN FRAMES (Hand Loom Dept.)

*Mordants and other Chemical Compounds used in textile coloring not classified as dyestuffs.*

Theory of mordants, their chemical properties and their application, aluminium mordants, iron mordants, tin mordants, chromium mordants, organic mordants, tannin materials, sulphated oil, fixing agents, leveling agents, assistants, etc.

*Theory of Dyeing.*

Chemical, mechanical, solution, etc.

*Natural Coloring Matters.*

Origin, properties, application of indigo, log-wood, catechu or cutch, Brazil wood, cochineal, fustic, tumeric, madder, quercitron bark, Persian berries, etc.

*Artificial Coloring Matters.*

General discussion of their history, nature, source, methods of manufacture, and methods of classification.

Special study of :—

Direct Cotton Colors.

Basic Coloring Matters.

Acid Dyestuffs.

Phthalic Anhydride Colors, including the eosins, rhodamines, phloxines, etc.

Alizarine Colors, including other artificial coloring matters requiring a metallic mordant.

Insoluble Azo Colors, developed on the fibre.

Aniline Black, artificial indigo, and other artificial dyestuffs not coming under the above heads.

*Machinery Used in Dyeing.*

A certain amount of time will be devoted to the description of the machinery used in the various processes of textile coloring and this will be supplemented as far as possible by the use of charts, diagrams, lantern slides, etc.

#### OUTLINE OF LABORATORY AND PRACTICAL WORK.

Besides lectures and recitations upon this subject, those taking the regular day course in Chemistry and Dyeing will be required to do at least fifteen hours per week of practical laboratory work. By the performance of careful and systematic experiments the student will learn the nature of the various dyestuffs and mordants, their coloring properties, their action under various circumstances and the conditions under which they give the best results. The more representative dyestuffs of each class will be ap-



HAND LOOMS

plied to cotton, wool and silk, and each student will be obliged to enter in an especially arranged sample book, a specimen of each of his dye trials with full particulars as to conditions of experiment, percentage of compounds used, time, temperature of dye bath, etc.

For convenience and economy, most of the dye trials will be made upon small skeins or swatches of the required material, but from time to time students will be required to dye larger quantities.

By the use of a small printing machine the principles of calico printing, and with the introduction of small dyeing machines, vats, etc., the practical side of the subject will be studied, and it will be the constant endeavor of those in charge, to impart such information of a theoretical and scientific character as is usually difficult to obtain in a dyehouse.

### CHEMICAL PHILOSOPHY.

This will be a continuation of the Stoichiometry of the first year.

It will include a general consideration of matter, the principles of hydrostatics, including the laws of specific gravity, and pneumatics, calorimetry, specific heat, vapor density, the important laws of solution, and the various methods of determining molecular weights.

The student will be required to deduce formulæ, and work out a large number of problems introduced by the subject.

### ADVANCED INORGANIC CHEMISTRY.

The whole subject of inorganic chemistry will be reviewed during the second half the second year, and many advanced topics will be introduced which were necessarily omitted from the first year course in General Chemistry.

### ORGANIC CHEMISTRY.

This subject, which was introduced during the latter part of first year general chemistry, will be continued during the whole of the second year as a special subject. The study will be taken up in a thorough manner and by the end of the year the student will understand the composition of the important artificial dyestuffs and the equations representing the reactions involved in their manufacture.

It will include lectures, recitations and laboratory work.

### INDUSTRIAL CHEMISTRY.

This subject will be taken up during the third year, particular attention being paid to those branches which are of special interest to the textile chemist, as oils, soaps, the gas and coal tar industry, building materials, and the manufacture of the important chemical compounds, acids, alkalies, bleaching powder, various mordants, etc., on a large scale.



The course will be illustrated as far as possible with experiments, specimens, diagrams, and charts, and the students will be given an opportunity to visit some of the industrial establishments in the vicinity of Lowell and Boston.

#### ADVANCED TEXTILE CHEMISTRY AND DYEING.

This will be a continuation of the Textile Chemistry and Dyeing of the second year, and will include a review of the second year's work, with the introduction of many advanced subjects; such as dye testing, calico printing, comparative dye trials, and numerous problems that arise in the dye house.

The course will include a large amount of work in the dyeing laboratory and will be supplemented by trips to a number of the large dye houses and print works in the vicinity.

#### QUANTITATIVE ANALYSIS.

This subject is taken by all regular Chemistry and Dyeing students, and extends through the second and third years of the course.

##### THE SECOND YEAR WORK.

Consists of a thorough training in the general principles of analytical work, the ground covered being practically that found in "Talbot's Quantitative Analysis." Each student is assigned a desk in the laboratory for his sole use, and is required to perform a large number of analyses independently.

##### THE THIRD YEAR WORK.

Is designed to give the student sufficient experience to allow him to deal intelligently with technical problems. The laboratory work will consist of the analysis of such substances as lubricating oils, alkalies, soaps, coal, water, bleaching powder, lime, etc.

#### MICROSCOPY.

The value of the microscope in the detection and examination of the various fibers cannot be over estimated, and often facts may be discovered, and conclusions drawn, which could be arrived at in no other way.

The students in this course will be given as much work with the microscope as time will permit. They will receive instructions in the use of the best microscopes made, and will not only have practice in the examination and detection of the fibers but will be required to become proficient in the preparation of permanent slides.

Upon completion of this course, each student is required to present a thesis and do a certain amount of original work on some subject appropriate to this department. When this thesis has been approved by the head of the department, and accepted by the Principal, and examinations successfully passed in all required subjects, the student will be entitled to the regular school diploma.

## Weaving Department.

### SECOND YEAR.

The process of making pattern warps.

The construction and use of Spooling and Quilling Machinery for wool and cotton.

The construction and use of Warpers of various kinds.

Long and short chain systems of preparing warps and filling.

Sizing materials and size mixing machinery.

The Woolen Sizing Machine.

The Woolen Beamer.

Drawing-in and twisting.

Operation of machines named above, and warp preparation in cotton, woolen and worsted, silk and linen, timed to correspond with the respective lectures.

The plain power loom and its construction.

Shedding by cams.

Various pickers and picking motions.

Fast and loose reeds.

Take up and let-off motions.

Minor adjustments of the power loom.

Plain looms as altered for weaving fancy cloth.

Looms constructed for several shuttles.

Drop box motions.

Shedding motions.

Single acting dobbies.

Double acting dobbies.

Spring boxes and other motions for returning harness.

Chain building for dobbies.

Chain building for box looms.

Towel and other pile cloth weaving.

Practical work on the above looms, including teaching the student to weave, and fix looms.

Also pulling down looms and rebuilding same, including timing and setting.

This work will be arranged to correspond with the respective lectures.

Lessons on calculations applied to the machines and processes named above.

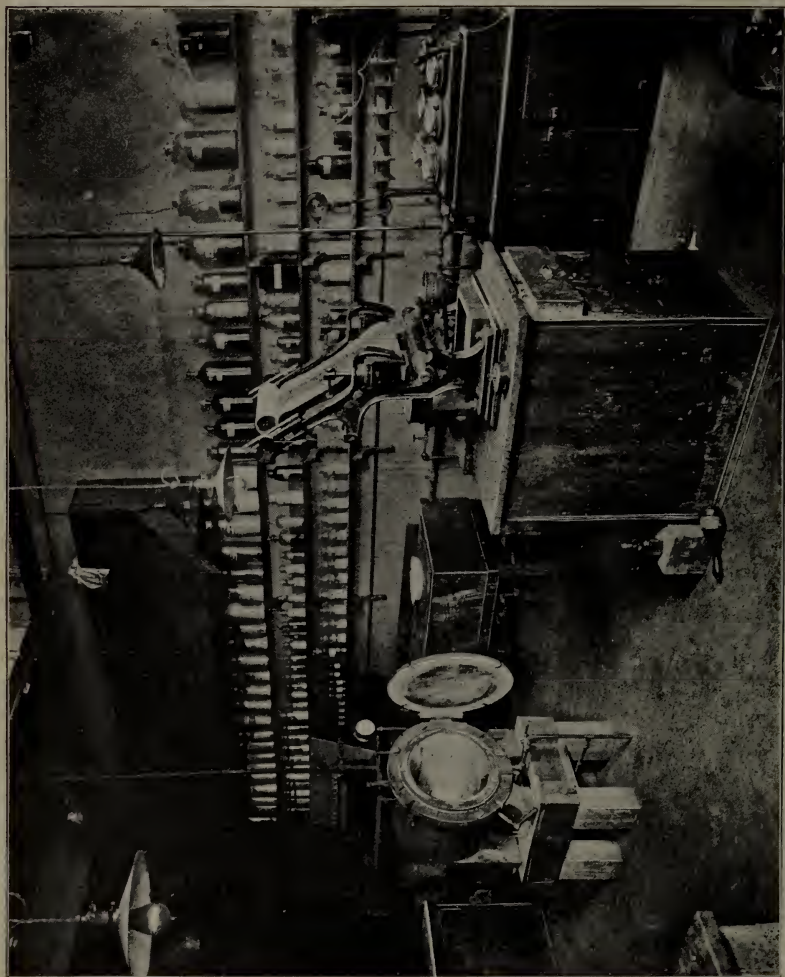
### THIRD YEAR.

Handkerchief Motions.

Lappet Motions.

Leno Weaving.





PRINTING MACHINE AND STEAMING BOX

Open and close shed Looms.  
 Lectures on Jacquard machinery.  
 Single lift Jacquards.  
 Double lift Jacquards.  
 Leno Jacquards.  
 Jacquards specially arranged for ingrain carpet work.  
 Tapestry weaving, quilt weaving etc.  
 Weave room engineering and equipment.  
 Cost of weave mill operation and statistics of operations.

## Department of Mechanics.

### FIRST YEAR — FIRST TERM.

Elements of Mechanism. Force and Work, Measurement of Screw. Worm and Wheel. Pulley Blocks. Inclined Plane and Wedge. Rolling Cylinders and Cones. Gearing, Spur and Friction. Flexible Connectors. Belts. Cords. Chains.	Levers. Theory and Design. Cams. Wipers. Toggle Joints. Quick Return Motions. Harmonic Motion. Wheels in Trains. Mangle Wheels. Aggregate Combinations. Differential Pulleys. Epicyclic Train, Compounds. Disc and Roller.
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### SECOND TERM.

Applied Mechanics.  
 Strength of Materials.

In the above topics will be included as many problems as possible, dealing with the construction of and maintenance of mills, not with the purpose of educating mill engineers, but rather to familiarize the student with the means at hand and processes employed in erecting structures for manufacturing, that they may study their government more advantageously.

### SECOND YEAR — FIRST TERM.

Motive Powers:

Water. Steam. Gas.	Dynamometers. Measurement of power. Pressure and impulse wheels.
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CHEMICAL LABORATORY

Electricity.

Turbines, in-flow, out-flow, upward and mixed.

Suction and draft tubes.

Flow of water, quantity and power.

Water Meters.

Governors

Elements of Thermodynamics as applied to steam.

#### Steam Engine:

Simple, compound and triple expansion.

Plain Slide Valve.

Double ported, Corliss, and cam.

Condensing engines.

Coal consumption.

Use of exhaust steam for heating and dye-house purposes.

#### Indicator:

Construction of and use in measuring power and setting valves.

Practical use of indicator and computation of indicator diagrams.

Governors, throttling and cut-off.

Economy and Costs.

#### Gas engine theory:

Throttling type.

Hit and miss type.

Heat units in gas.

Governing devices.

#### THIRD YEAR.

Mill Construction.

Mill Ventilation.

“ Humidifying.

“ Warming.

“ Maintenance.

“ Fire Protection.

Several courses of lectures on allied subjects by outside lecturers will be added.

## Machine Drawing.

#### FIRST YEAR.

Care and use of instruments

Geometrical Constructions

Elements of Projections.

Isometric Drawings.

Working Drawings

Blue Print Process

#### SECOND YEAR.

Practical sketching from machines, both for mechanism construction and detail, and assembly drawing.



PLAIN LOOM



# Electrical Engineering.

SECOND YEAR — SECOND TERM.

## Frictional Electricity:

- Electric Attraction and Repulsion.
- Two kinds of Electrification.
- Electroscopes.
- Unit Quantity of Electricity.
- Electrification by Influence.
- The Electrophorus.
- Free and Bound Charges.
- Conduction.
- Distribution of Charges on Bodies.
- Electric Machines.
- Condensers — Leyden Jar.

## Magnetism:

- Natural Magnets.
- Artificial Magnets.
- Magnetic Needle.
- Magnetic Substances.
- Unit Strength of Pole,
- Upon what the Lifting Power of a Magnet depends.
- Magnetic Field.
- Laws of Magnetic Force.

## The Electric Current:

- Conditions necessary for Flow of Current.
- Direct and Alternating Currents.
- The Voltaic Cell.
- Electromotive Force.
- Resistance.
- Volt — Ampere — Ohm — Watt — Kilowatt.
- Amalgamation of Zinc.
- Polarization and Remedies for it.
- What constitutes a good Voltaic Cell.
- Different kinds of Cells.
- Ohm's Law.
- Divided Circuits.
- Magnetic Action of the Current.
- Induction.
- Cutting of Magnetic Lines by a wire.
- Law of Lenz.
- Induction Coil.





FANCY LOOMS

## Electrical Measuring Instruments :

- Tangent Galvanometer.
- Astatic Galvanometer.
- D'Arsanval Galvanometer.
- The Weston Voltmeter.
- The Weston Ammeter.
- The Electrodynamometer.
- Watt Meters
- The Thomson Recording Wattmeter.

## The Dynamo :

- Theory of the dynamo.
- Alternating Current Generators.
- Commutation.
- Direct Current Generators.
- Ring and Drum Armatures.
- Series Shunt and Compound Machines.
- Open and closed Coil Machines.
- Characteristics.
- Losses in the dynamo. Hysteresis.
- Eddy Currents — Heating — Friction.

## Alternating Currents :

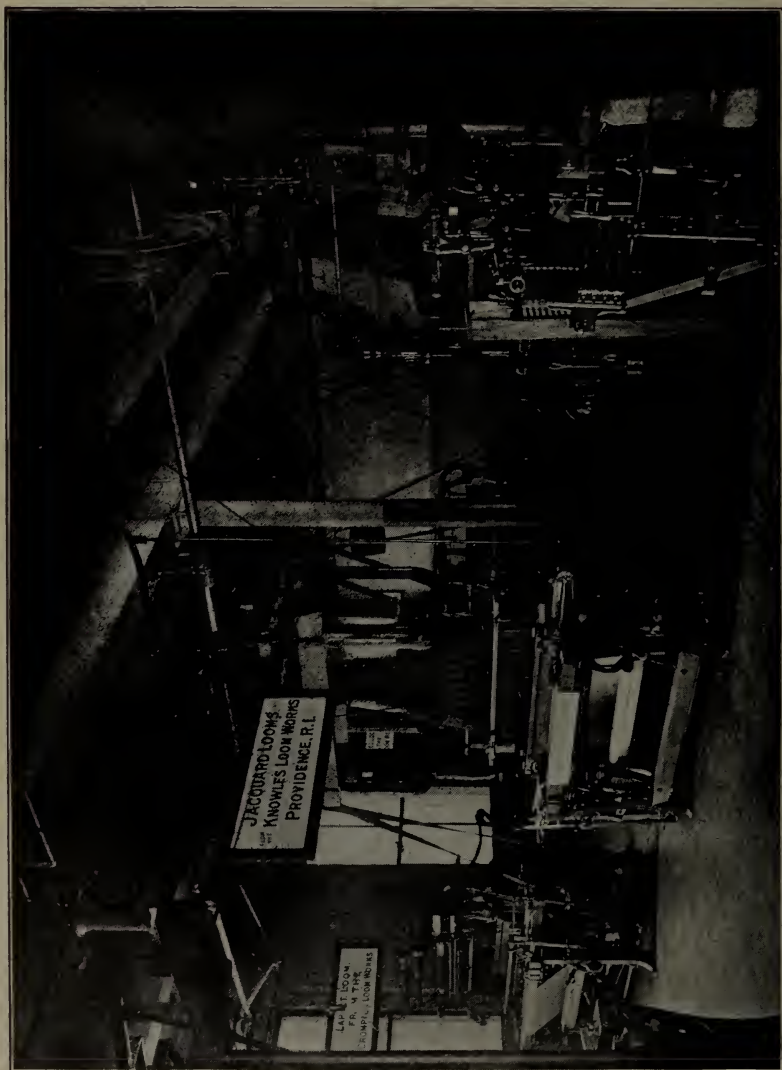
- Phase relation between E. M. F. and Current.
- True and apparent Watts.
- Power Factor.
- Three Phase Current.

## The Motor :

- Theory.
- Series and Shunt Motors.
- Alternating Current Motors.
- Synchronous Motor.
- Rotating Field.
- Induction Motor.
- Incandescent Lamp.

## Electrical Distribution :

- Series and Parallel Distribution.
- Direct Current Distribution.
- Transformer.
- Rotary Converters.



JACQUARD LOOMS

### THIRD YEAR.

Experimental Work in Statical Electricity.  
Magnetic Experiments.  
Tests of Voltaic Cells.  
Use of the Galvamometer.  
Resistance Measurements.  
Wheatstone Bridge.  
Slide Wire Bridge.  
Speed Counters.  
Tests of Arc Lights.  
Tests of Incandescent Lights.  
Incandescent Light Photometry.  
Test of Thompson Wattmeter.  
Transformer Testing.  
Voltmeter Calibration.  
Ammeter Calibration.  
Plotting Characteristics of Series, Shunt and Compound Dynamos.  
Dynamo Testing.  
Motor Testing.  
Use of the Motor as a Dynamometer.  
Power Plant Test.

### Decorative Art Department.

As a knowlege of the principles of design decoration and color is necessary to the success of the textile industry, the Department of Decorative Art has been formed to fill this need and is included in the regular course.

It will include the following :—

#### The Theory of Color.

The value of color.

The relation of various colors and their effect upon each other.

Harmony, contrast, analogy.

This will also include the making of diagrams and color charts illustrating these principles, and the matching of colors.

#### The principles of Design.

The study of the elements, and characteristics of design.

The study of geometric conventional and naturalistic forms, and adaptation of these forms to the construction of design.

Diaper ornament, repeats and the principles of geometric basis for the same.

#### Lectures on Ornament.

In connection with the above; lectures are given on the History of Ornament and its bearing on modern art, illustrated by stereopticon and colored plates.

## **Decoration.**

Special arrangements have been made to form classes in freehand drawing and decoration, for the purpose of giving the students general instruction in the theory and practice of decorative art, the instruction afterward to be devoted to the special branch the student desires to follow. The school will thus fulfil the object of preparing the student in practical designing in any of the branches of decorative art, with special regard to fabrics.

The class in decoration and design is for the purpose of teaching the principles that enter into every species of design and while it is intended especially for fabrics, jacquard, damasks, carpets, table-cloths, etc., it is equally applicable to any branch of Decorative Art, and would include the designing of wall paper, book covers, silver, interior decoration, etc.

## **Class in Drawing, Painting and Composition.**

This class will be for the benefit of those wishing to become painters, decorators or illustrators.

In this class drawing, painting and composition will be taught, and later, should the size of the class warrant it, drawing from the model will be introduced.

This class will be modelled after the Julian Academy of Paris.

Professor George's long experience abroad and in years of teaching in Boston makes this an exceptional opportunity for the students wishing to avail themselves of it.

The classes will be in session Tuesdays and Thursdays from 9 to 12 and 2 to 4, and Saturday from 9 to 12.

## **Stenography and Typewriting.**

As an incidental study in the Commercial Course, arrangements have been made for instruction in Stenography and Typewriting. In many cases where there is a demand from selling houses for clerks who are familiar with the more technical portions of the business, a greater facility for handling the work will be had, if the clerk is familiar with the above named branches. The course is optional, and a fee will, for the present be charged, depending upon the length of the course taken.



## **Languages.**

A department of modern languages has been established at the School; students at the school are offered either of these courses free.

Others who may desire to avail themselves of these language courses, without taking other courses, may do so at a charge of \$8 for 20 lessons.

In general the classes will meet after four o'clock in the afternoon.

Announcement of the classes, and further information may be had by addressing the Principal.

## **General Lectures.**

Lectures on the various branches and specialties of the textile business will be given from time to time. Among the subjects will be:

Mill Construction.

Mill Ventilation and Warming.

Electricity.

Steam Motors.

Fibers.

The Wool Situation.

The Cotton Situation.

Patent Law.

## **Evening Classes.**

The courses of instruction offered in the evening are identical with those of the day, with the exception that less time is devoted to the machine work, since, in most cases this is of small moment; ordinarily the handling of the machinery is a part familiar to most of the students through contact with it in the day time, and in such cases the explanations and calculations are of the greater importance. In some cases it is possible to pursue two courses together, but this depends always on the arrangement of the schedule for any particular year.

The evening courses are free to graduates of the Evening High and Drawing Schools, operatives of the mills and machine shops, and other residents of Lowell, to such numbers as may be accommodated in the order in which they are received.

The requirements for admission to the Evening Classes are similar to those for the day. Graduates of other schools, will be received on presentation of proper credentials; for all others, examinations will be held on Thursday, Sept. 25, at 7 p. m. at the School. The candidates must be familiar with the English language, and the principles of arithmetic; for the first part, a short composition must be written on a given theme, and a certain amount must be written from dictation, while in the latter will be included addition, decimals, fractions, percentage, ratio and proportion.



### **Subjects.**

The list of subjects embraced in each course is identical with that of the day and may be found beginning at page 46.

### **Certificate.**

With the honorable and satisfactory completion of either of the regular evening courses in any subject, the certificate of the School will be awarded.

#### **Course I, Cotton Spinning,—3 Years.**

Fee for all except residents of Lowell, \$2.50 per term, \$5.00 per year. See page 46.

#### **Course II [A], Woolen Spinning.—1 Year.**

#### **Course II [B], Worsted Spinning.—2 Years.**

Fee for all except residents of Lowell, \$2.50 per term, \$5.00 per year. See pages 47 and 48.

#### **Course III, Designing.—3 Years.**

Fee for all except residents of Lowell, \$2.50 per term, \$5.00 per year. See page 49.

#### **Course IV, Chemistry and Dyeing.—4 Years.**

Fee for all except residents of Lowell, \$2.50 per term, \$5.00 per year. A deposit of \$5 will be required from all who take this course, whether residents of Lowell, or not, to cover the cost of the laboratory breakages at the end of the year any unexpended balance will be returned, or an extra charge made as the case may be. See page 55.

#### **Course V [A], Warp Preparation.—1 Term.**

Fee for all except residents of Lowell, \$2.50. See page 65.

#### **Course V [B], Weaving.—2 Years.**

Fee for all except residents of Lowell, \$2.50 per term, \$5.00 per year.

NOTE :—To secure the diploma of the School in Course V, both A and B must be completed. Course V [A] may be taken with Course V [B], so that the whole may be completed in two years. See page 65.

#### **Course VI, Mechanical Engineering.—2 Years.**

Fee \$2.50 per term. Free to residents of Lowell. See page 67.

### **General.**

The schedule showing the arrangements of classes for each term will be announced at the opening of each term.

REFERENCE NO.	YEAR	TERM	HOUR PER WEEK	PREPARA- TION	METHOD OF INSTRUCTION	INSTRUCTOR IN CHARGE	TAKEN BY	
Arithmetic	1	Entrance						
English	2	"						
Geography	3	"						
Algebra	4	1	1	2	1			
Geometry	5	(Given in connection with No. 12 for the present)			Lecture Recitation	{ Perkins { E. E. Nelson	All regular	
Elements Mechanism	10	1	1, 2 & 4	3	4	Lecture Recitation	{ Crosby { Perkins	All regular
F. H. Drawing	11	1	1	2	1, 2	Lecture Recitation	George	All regular
Mechanical Drawing	12	1	1 & 2	6	1, 2	Lecture		All regular
Applied Mechanics	13	2	1	2	10, 12	Recit. Lab.		
Machine Drawing	14	2	1 & 2	4	10, 12	Lecture		Crosby I, II, III, & V
Mechanism Drawing	15	2	2	2	11, 12	Lab.		Perkins All regular
Mill Engineering	16	3	1 & 2	1	13	Lecture		E. E. Nelson
Electrical Engineering	17	2	2	2	10, 13, 14	Lecture		All regular
"	18	3	1-2	2	17	Recitation	E. E. Nelson	All regular
					Lecture		E. E. Nelson	
Design Construction	25	1	1 & 2	2	1, 2	Recitation		
Cloth Construction	26	1	1 & 2	2	1, 2	Lecture	Umpleby I, II, III, & V	
Cloth Analysis	27	1	1 & 2	2	1, 2	Recitation	Barr	
					Lab.		Umpleby	"
Hand Looms	28	1	1 & 2	2	1, 2	Recitation	Barr	
					Lab.		Umpleby	"
Design Construction	29	2	1 & 2	2	25, 26	Lecture	Pradel	
Cloth Construction	30	2				Recitation	Umpleby	"
							Barr	

REFERENCE No.	YEAR	TERM	HOURS PER WEEK	PREPARA- TION	METHOD OF INSTRUCTION	INSTRUCTOR IN CHARGE	TAKEN BY
Cloth Analysis	31	2	1 & 2	2	Lecture	Umpleby	I, II, III & V
Hand Looms	32	2	1 & 2	2	Recitation Lab.	Barr Umpleby Pradel	III
Design Construction	33	3 }	1 & 2	2	Lecture	Umpleby	I, II, III, V
Cloth Construction	34	3 }	1 & 2	2	Recitation	Barr	"
Cloth Analysis	35	3	1 & 2	2	Lecture	Umpleby	"
Hand Looms	36	3	1 & 2	2	Recitation Lab.	Barr Umpleby Pradel	"
Design Construction	37	A course similar to 25-36 given in the afternoon for students tak- ing Decorative Art.					
Cloth Construction	38						
Cloth Analysis	39						
Hand Looms	40						
General Chemistry	50	1	1 & 2	3	Lecture	Olney	All regular
General Chemistry	51	1	1 & 2	6	Recitation Lab.	{ Olney Spencer French }	"
Qualitative Analysis	52	1	2	8	Lab.	{ Spencer French }	IV
Stoichiometry	53	1	2	2	Lecture	Spencer	IV
Advanced Inorganic	54	2	2	2	Lecture	Spencer	IV
Chem. Philosophy	55	2	1	2	Lecture	Spencer	IV
Organic Chemistry	56	2	1 & 2	2	Lecture	Olney	IV
Tex. Chemistry & Dyeing	57	2	1 & 2	3	Lecture	Olney	All regular

REFERENCE NO.	YEAR	TERM	HOURS PER WEEK	PREPARA- TION	METHOD OF INSTRUCTION	INSTRUCTOR IN CHARGE	TAKEN BY
Tex. Chemistry & Dyeing	58	2	1 & 2	16	37-50-51	Olney	IV
Quantitative Analysis	59	2	1 & 2	2	56	Moorehouse	IV
"	60	2	1 & 2	10	59	French	IV
Industrial Chem.	61	2	1	10	56	Olney	IV
Tex. Chemistry & Dyeing	62	3	1 & 2	15	57-58	Spencer Olney	IV
"	63	3	1 & 2	1	57-58	Moorehouse	IV
Industrial Chem.	64	3	1 & 2	1	61	Olney	IV
Quantitative Analysis	65	3	1 & 2	2	59-60	French	IV
"	66	3	1 & 2	16	59-60	French	IV
Microscopy	67	3	1 & 2	2	57-58	Olney	IV
Cotton Fibre	75	1	2	2	10-11-12	French	I
" Preparing & Carding	76	1	2	4	75-10-11-12	Humphrey Humphrey	I
" Drawing	77	2	1	4	75-76	Smith	I
"	78	2	1	6	77	Humphrey Humphrey	I
" Ring Spinning	79	2	2	5	78	Smith	I
"	80	2	2	6	79	Humphrey Humphrey	I
" Combing	81	3	1	4	80	Smith	I
"	82	3	1	9	81	Humphrey Humphrey Smith	I I

REFERENCE No.	YEAR	TERM	HOURS PER WEEK	PREPARA- TION	METHOD OF INSTRUCTION	INSTRUCTOR IN CHARGE	TAKEN BY
Cotton Mule Spinning	83	3	2	4	82	Lecture	I
" Spooling, Warping etc.	84	3	2	9	83	Lab.	I
Wool Fibre	90	1	2	6, 5	10-11-12	Lecture	II
Woolen Carding	91	1	2	6, 10	90	Recitation Lab.	II
Woolen Spinning	92	2	1	11	91	Lecture	II
Worsted Carding	93	2	2	11, 5	90	Lab.	II
Combing & Top Making	94	2	2	11, 10	93	Lecture	II
Worsted Drawing	95	3	1 & 2	15	94	Lab.	II
Spinning & Twisting	96	3	1 & 2	1	{ 33, 34, 50, 51, 92, 96, 96, 108	Lab.	II
Finishing	97	3	1 & 2	1	{ 10-11-12 25-26-27-28	Lecture	II
Plain Loom Constr'n	105	2	1	4	105	Lab.	All regular " " " "
Weaving	106	2	2	7	106	Lecture	W. Nelson
Weaving	107	3	1	11	106	Lab.	Buchan
Weaving	108	3	2	11	107	Lecture Lab.	I, II, III, V I, II, III, V

REFERENCE No.	YEAR	TERM	HOURS PER WEEK	PREPARA- TION	METHOD OF INSTRUCTION	INSTRUCTOR IN CHARGE	TAKEN BY
Weaving Mechanism	109	2	1 & 2	11	Lecture		V
"	110	3	1 & 2	109	Lab. Lecture Lab. Lab.	W Nelson Buchan	V
F. H. Drawing	120	1	1 & 2	2		George	Special Art
Historic Ornament	121	1	1	10	Lecture	George	All regular
Design Color		1 & 2	1 & 2	13	Lab.		III Special Art
Drawing	122	3	1 & 2	13	Lecture	George	III
Painting	123	1 & 2	1 & 2	13			
Illustrating	124	1 & 2	1 & 2	13			
Decoration	125	3	1 & 2	13			
& Design	126	3	1 & 2	13			
Historic Ornament	127	1	2	125	Lab.	George	Special Art 125-126-127
Color	128	1	2	125			



## Register of Day Students.

### Third Year.

	COURSE.	
ROBERT A. CARTER,	IV	Reading, Mass.
CLARENCE E. CRAIG,	III	Lowell, Mass.
C. ERNEST CURRAN,	II	Lawrence, Mass.
ARTHUR F. FERGUSON,	I	Boston, Mass.
BENJAMIN HOLGATE,	III	Lowell, Mass.
GARABED NAJARIAN,	IV	Rowley, Mass.
THEODORE E. RAMSDELL,	I	Housatonic, Mass.
CLAIRE S. TAYLOR,	II	Worcester, Mass.
GARDNER M. YOUNGMAN	II	Newberry, Wyoming Co., Pa.
CHARLES T. WING,	III	Lowell, Mass.
HARRY L. WOODMAN,	I	Lowell, Mass.

### Second Year.

E. H. BENNETT,	II	Saugus, Mass.
WILFRED N. BLOOM,	IV	Medford, Mass.
EDWARD J. C. BULLOCK,	II	Warren, R. I.
ORISON S. CAMPBELL,	II	Ware, Mass.
FREDERICK E. CHAMBERLIN,	I	Jamaica Plains, Mass.
FRANK W. EMERSON,	II	Lawrence, Mass.
DUNCAN M. FAISON,	I	Raleigh, N. C.
GEORGE FULLER,	I	Adams, Mass.
ARTHUR M. HANLEY,	III	Worcester, Mass.
J. P. HARRIMAN,	III	Mattapan, Mass.
GEORGE S. HARRIS,	I	Rome, Ga.
BERTRAM D. MCKENZIE,	IV	Carlton Hill, N. J.
FRED C. MORRISON,	I	Dover, N. H.
WILLIAM O'HARA,	IV	Chelmsford, Mass.
WILLIAM A. RASCHE,	I	New York City.
WILLIAM C. ROBINSON,	III	Melrose Highlands, Mass.
JOHN S. ROSENTHALL,	II	Newton, Mass.
FRED N. SNELLING,	II	Haverhill, Mass.
EDWARD SPEIGEL,	II	New York City.
WALTER L. STEWART,	I	" " "
FRED G. STONE,	II	No. Andover, Mass.
MURRAY R. STEVENSON,	III	Clinton, Mass.

### First Year.

EDWARD M. ABBOT,	II	Westford, Mass.
CHARLES B. BARKER,	I	Farmington, N. H.
FREDERICK A. BALDWIN,	II	Andover, Mass.
FRED M. BELANGER,	I	Haverhill, Mass.
CLARENCE A. BURNETTE,	I	Putnam, Conn.
CHARLES R. CARR,	I	Warren, R. I.
W. E. CARTER,	II	Clinton, Mass.
F. AUSTIN CLAPP,	II	Malden, Mass.

NAME.	YEAR.	COURSE.	ADDRESS.
RAYMOND CLOGSTON,	IV		Bradford, Mass.
JOHN P. COCHRAN,	I		Maysville, Ky.
RALPH F. CULVER,	IV		Ayer, Mass.
BENJAMIN W. CUTLER, JR.,	III		West Somerville, Mass.
CLARENCE L. CUTLER,	IV		Lowell, Mass.
JAMES F. DEWEY,	II		Montpelier, Vt.
ALBERT E. DONALD,	II		Springfield, Mass.
G. P. EHLERS,	I		Little Rock, Ark.
ALFRED W. EVANS,	II		Haverhill, Mass.
WILLIAM R. EVANS,	II		Haverhill, Mass.
ARTHUR W. R. EDWARDS,	III		Chatham, Mass.
HAROLD C. FAISON,	I		Winton, N. C.
PAUL E. FECHNER,	I		Manchester, N. H.
ALFRED A. FOSS,	III		Brookline, Mass.
JAMES H. GEANEY,	I		No. Andover, Mass.
ELAM R. HALSELL,	I		Meridian, Miss.
HARRY HEBDEN,	I		Waltham, Mass.
GEO. G. HORSFALL,	I		Martinsburg, West Va.
ALFRED E. JURY,	IV		Malden, Mass.
EVERETT A. JONES,	II		Franklin Falls, N. H.
HUGH KENDRICK,	I		Raleigh, N. C.
WILLIAM H. KENNEDY,	I		Dover, N. H.
EDMUND A. LUCEY,	II		Natick, Mass.
FRANK M. MESSENGER	I		North Grosvenor Dale, Conn.
WALLACE A. MACPHERSON,	I		No. Adams, Mass.
HAROLD D. PAINE,	I		Wakefield, "
EVERETT N. PARKER,	II		Lowell, "
G. E. PETTY,	I		Archdale, N. C.
W. W. POTTER,	I		Pawtucket, R. I.
ROBERT F. PRESTON,	I		Wakefield, Mass.
E. J. ROTHCHILD,	I		Woodville, Miss.
HERBERT M. SCHOFIELD,	III		Rockville, Conn.
HAROLD D. SERRAT,	I		Malden, Mass.
RALSTON F. SMITH,	I		New Hartford, Conn.
DEXTER STEVENS,	I		Malden, Mass.
CHARLES V. SWANTON,	I		Andover, "
SIDNEY E. TOOVEY,	II		Orleans, "
FRANK H. WEBB,	IV		Haverhill, "
ROYAL P. WHITE,	II		Lowell, "
WALTER E. H. WILSON,	I		" "
ARTHUR G. WRIGHT,	III		" "

### Special Course.

LOUISE P. CAMPBELL,	III b	Lowell, Mass.
J. D. O'DONNELL,	VI	Holyoke, "
FRED I. EMERY,	VI	Cambridge, "
GRACE L. HUMPHREY,	III b	Lowell, "
FLORENCE E. PIERCE,	IV	" "
LENA A. PERHAM,	III b	" "
LOUISE R. READER,	III b	" "
ISABELLA H. REYNOLDS,	III	No. Andover, "
THOMAS F. RILEY,	III b	Lowell, "
CARRIE B. ROBERTS,	III b	" "

## LIST OF EVENING STUDENTS, 1901-1902.

NAME.	YEAR.	COURSE.	ADDRESS.
ADAMS, W. R.	I	II a	No. Andover, Mass.
AINLEY, A.	I	III	Lowell, Mass.
ALDERTON, R. J.	I	II b	No. Chelmsford, Mass.
ANDERTON, F.	I	II a	Lowell, Mass.
ALLEN, F.	I	I	" "
ASTLEY, A.	I	I	" "
ASTLEY, J. H.	I	V	" "
ATKINSON, T.	I	II b	" "
BAKER, H. R.	I	I	" "
BALDWIN, F. A.	I	II a	Andover, Mass.
BALLOU, L. H.	I	III	Melrose Highlands, Mass.
BARRY, L.	I	IV	Lowell, Mass.
BEAUMONT, W.	I	VI	Lowell, Mass.
BEGLEY, T.	I	III	Lawrence, Mass.
BENT, T.	I	IV	Lawrence, Mass.
BENT, W. J.	I	IV	Lowell, Mass.
BENTLEY, J.	I	I	" "
BIRSCHALL, J. H.	I	VI	" "
BIRTWELL, F.	I	VI	" "
BIXBY, G. C.	I	I	" "
BLACKMER, A. J.	I	I	" "
BRENNAN, J.	I	V	Lowell, Mass.
BRIMIGION, C.	I	IV	" "
BURGHARDT, E. S.	I	II a	Lawrence, Mass.
BURNS, E. J.	I	IV	Lowell, Mass.
BURNS, J. J.	I	IV	" "
BURLEIGH, D. P.	I	V	" "
BUTTERFIELD, M. R.	I	VI	Lowell, Mass.
BYAM, W. S.	I	VI	" "
CADY, A.	I	VI	" "
CADY, D. J.	I	V	" "
CALLAHAN, P.	I	VI	No. Chelmsford, Mass.
CAMPBELL, A. R.	I	VI	Lowell, Mass.
CARR, H. F.	I	IV	" "
CARDEN, F.	I	VI	" "
CARTER, G.	I	I	" "
CHADWICK, A. F.	I	V	" "
CHARLES, W. G.	I	III	" "
CHASE, R. F.	I	II b	" "
CHEETHAM, J. J.	I	I	" "
CLAY, H. E.	I	VI	" "
COBURN, C. H.	I	VI	" "
COLLIER, W. A.	I	V	" "
COLLINS, GEORGE D.	I	II b	" "
COLLINS, T.	I	II a	" "

NAME.	YEAR.	COURSE.	ADDRESS.
COLLINS, T. M.	I	v	Lowell, Mass.
COLLINS, W. E.	I	v	" "
CONLON, P. F.	I	IV	" "
CORNOCK, C. W.	I	II b	" "
COYNE, J. E.	I	v	" "
CROWE, J. F.	I	II a	" "
CROWELL, E. E.	I	III	" "
CROWLEY, E. J.	I	I	" "
CROWLEY, J.	I	VI	" "
CROWLEY, W. A.	I	I	" "
CUNNINGHAM, G. D.	I	III	" "
DAKIN, J. K.	I	III	" "
DAVIS, J. W.	I	VI	" "
DELCHANTY, M.	I	v	" "
DELMAGE, E. R.	I	III	" "
DICKSON, T. A.	I	IV	" "
DIMLICK, B. C.	I	III	Lawrence, Mass.
DOLAN, E. A.	I	IV	" "
DOOLE, G.	I	IV	Lowell, Mass.
DONOGHUE, P. F.	I	VI	" "
DONNELLAN, F.	I	II a	" "
DRIVER, J. T.	I	II b	" "
DUGGAN, W. T.	I	II a	" "
DUNHAM, B.	I	III	" "
EAGAN, C. H.	I	III	" "
EDWARDS, A. W. R.	I	VI	Chatham, Mass.
EVANS, ALFRED W.	I	II a	Haverhill, Mass.
EVANS, W. R.	I	II a	" "
FAGAN, F. W.	I	II a	Lowell, Mass.
FARNELL, R. P.	I	IV	Collinsville, Mass.
FARRELL, O.	I	II a	Lowell, Mass.
FECHNER, P. E.	I	I and v	" "
FEENEY, E. B.	I	II b	Lawrence, Mass.
FIELD, C. W.	I	I	Lowell, Mass.
FIFE, G.	I	IV	" "
FIFIELD, II. L.	I	IV	" "
FISH, G.	I	VI	" "
FITZGERALD, T.	I	VI	" "
FLEMING, J.	I	II b	Lawrence, Mass.
FLETCHER, M. J.	I	III	Lowell, Mass.
FLYNN, J. J.	I	VI	" "
FOLEY, M. J.	I	II b	Lawrence, Mass.
FORREST, F. G.	I	II and v	Lowell, Mass.
FRANK, E. M.	I	III	Lawrence, Mass.
FREEMAN, F. E.	I	II b	" "
FRENCH, F. B.	I	II b	" "
FULTON, R. S.	I	VI	Lowell, Mass.
GAGAN, J. H.	I	v	" "
GAGNON, G.	I	v	" "
GAUNT, W.	I	II b	" "
GAHIN, W. H.	I	VI	" "
GLEASON, J. M.	I	v	" "
GLYNN, J. J.	I	v	" "
GRANFIELD, W.	I	VI	" "
GRAY, F. M.	I	VI	" "
GREEN, P. A.	I	VI	" "

NAME.	YEAR.	COURSE.	ADDRESS.
HAGGETT, R. L.	1	11 a	Lowell, Mass.
HALL, F. C.	1	v	" "
HAMILTON, C.	1	vi	" "
HARRISON, ARTHUR	1	11 b	" "
HAUGHLIN, A.	1	iv	" "
HEDRICK, C. F.	1	i	" "
HEMPER, F.	1	i	Lawrence, Mass.
HINTZE, H. S.	1	vi	Lowell, Mass.
HOFFMAN, R.	1	v	Lawrence, Mass.
HOLGATE, D. R.	1	v	Lowell, Mass.
HOLGATE, J.	1	v	Lowell, Mass.
HOLLICK, C. E.	1	iv	Lawrence, Mass.
HOLT, L.	1	vi	Lowell, Mass.
HOLT, W. S.	1	i	Manchester, N. H.
HOLT, T. A.	1	i	Lowell, Mass.
HOUPES, C.	1	i	" "
HOYLE, J.	1	11 b	Lawrence, Mass.
HUNT, H. J.	1	vi	Lowell, Mass.
HUBY, W. T.	1	vi	Lawrence, Mass.
HUNTER, R.	1	v	Medford, Mass.
HUNTON, L. G.	1	iv	Lowell, Mass.
HURD, W. J.	1	vi	" "
HYDE, J.	1	iv	" "
JASPER, J. C.	1	vi	" "
JEANOTTE, A.	1	vi	" "
JOHNSON, S. L.	1	v	Lawrence, Mass.
JOHNSON, F. E.	1	iv	Lowell, Mass.
JUTRAS, A.	1	vi	" "
KELEHER, J. J.	1	11 b	Lawrence, Mass.
KELLY, M. H.	1	v	Lowell, Mass.
KENWORTHY, J.	1	i	" "
KING, W. F.	1	111	" "
KITCHING, J. M.	1	v	" "
KITTREDGE, J. S.	1	vi	" "
LABARGE, F. E.	1	i	" "
LAKE, W. F.	1	111	Lawrence, Mass.
LATHAM, D.	1	v	Lowell, Mass.
LAW, J. F.	1	vi	No. Chelmsford, Mass.
LANDREY, H.	1	i	Lowell, Mass.
LEARY, P.	1	i	" "
LEE, WALTER J.	1	v	" "
LEE, WILLIAM	1	v	" "
LINCOURT, H.	1	vi	" "
LINKLETTER, A. C.	1	vi	" "
LONGDEN, I.	1	i	" "
LORD, H. D.	1	111	" "
LORD, W.	1	11 b and v	Lawrence, Mass.
LOREGAN, J. T.	1	vi	Lowell, Mass.
LOWERING, F. A.	1	vi	" "
LUNDGREN, G. H.	1	vi	" "
MACBRAYNE, R. J.	1	111	" "
MADEN, H.	1	vi	" "
MALZ, L.	1	v	Lawrence, Mass.
MARSHALL, F.	1	iv	" "
MARTIN, J. C.	1	vi	Lowell, Mass.
MATTHEWS, G.	1	i	" "

NAME.	YEAR.	COURSE.	ADDRESS.
McCABE, J. L.	I	I	Lowell, Mass.
McCANN, M.	I	V	" "
McCLUSKEY, D. I.	I	II b	No. Chelmsford, Mass.
McCUE, H.	I	VI	Lowell, Mass.
McCARTHY, F. J.	I	V	" "
McDONALD, T. F.	I	I	Lawrence, Mass.
McELROY, G. W.	I	VI	Lowell, Mass.
McHUGH, F. II.	I	VI	" "
McLACHLAN, J. A.	I	III	Methuen, Mass.
McMAHON, D. F.	I	V	Lowell, Mass.
McNICHOLL, MISS L. S.	I	V	" "
McPIHETRES, S. A.	I	IV	" "
McQUADE, II. B.	I	III and V	" "
McQUAID, A. J.	I	I	" "
McQUAID, J.	I	V	" "
MEEHAN, T. H.	I	IV	" "
MILK, A.	I	I	Methuen, Mass.
MONAHAN, G.	I	I	Lowell, Mass.
MORAN, G. F.	I	VI	" "
MORRIS, F.	I	V	" "
MORRIS, J.	I	V	" "
MORSE, F. A.	I	II b	" "
MOZLEY, A.	I	VI	Dracut, Mass.
MOWATT, A. W.	I	VI	Lowell, Mass.
MUNRO, A. C.	I	III	Boston, Mass.
MURPHY, D. F.	I	VI	Lowell, Mass.
NELSON, E.	I	VI	" "
NICHOLSON, R.	I	II b	" "
NOBLE, J. T.	I	I	" "
O'DWYER, G. F.	I	III	" "
O'HEIR, O.	I	IV	" "
O'NEIL, J. II	I	VI	" "
O'NEIL, P. F.	I	IV	Lawrence, Mass.
PARK, F. B.	I	II b	Lowell, Mass.
PATRICK, A.	I	III	" "
PATRICK, M.	I	V	" "
PAYSON, C. C.	I	I	Brookline, Mass.
PEASLEY, E. A.	I	III	Lowell, Mass.
PELTIER, W. J.	I	VI	" "
PERRY, R.	I	IV	Lawrence, Mass.
PHANEUF, L. A.	I	VI	Lowell, Mass.
PHIELPS, W. E.	I	I	" "
POMFRET, J. O.	I	V	" "
POTTER, J. E.	I	II b	" "
PRESTON, B.	I	VI	" "
PRATT, D. M.	I	VI	" "
PROCTOR, F. D.	I	III	" "
RAIDY, P. F.	I	II b	Lawrence, Mass.
RAWNSLEY, G. F.	I	II	Lowell, Mass.
REDMAN, H. S.	I	III	Chelmsford, Mass.
REED, C. F.	I	VI	Lowell, Mass.
RICHARDS, W. C.	I	I and V	" "
ROAKE, B. H.	I	III	" "
ROBINSON, E. A.	I	III	" "
ROCHE, T.	I	V	" "
ROCKWELL, S. F.	I	II a	Andover Depot, Mass.



NAME.	YEAR.	COURSE.	ADDRESS.
ROGERS, J. T.	I	II a	Lowell, Mass.
ROONEY, G. W.	I	V	" "
ROUSE, J. C.	I	IV	" "
ROWE, T. F.	I	VI	" "
RUSSELL, D. C. M.	I	IV	" "
RYAN, J. A.	I	II a	" "
SALTONSTALL, THOMAS	I	II b	Lawrence Mass.
SAMUELS, E. F.	I	II b	Lowell, Mass
SARGENT, E. W.	I	III	Collinsville, Mass.
SARGENT, H. L.	I	I	Lawrence, Mass.
SAUNDERS, F. W.	I	V	Lowell, Mass.
SCANNEL, MISS K	I	IV	" "
SCHOON, F.	I	II b	Lawrence, Mass.
SHANNON, P.	I	III and V	Lowell, Mass.
SHARKEY, E.	I	VI	" "
SHAW, J.	I	VI	" "
SHERLOCK, J.	I	III	" "
SHON, W. T.	I	VI	" "
SILCOX, A. E.	I	V	" "
SILCOX, W. J.	I	II b	" "
SILK, F. C. M.	I	IV	" "
SMITH, R. W.	I	IV	" "
SMITH, T.	I	V	" "
SMITH, W. H.	I	IV	" "
SOUTHWELL, J.	I	II b	Lawrence, Mass.
SLACK, MICHAEL,	I	VI	Lowell, Mass.
STAVELY, S.	I	II b	" "
STERLING, J.	I	II b	" "
STERLING, W.	I	III	" "
STOPIERD, A.	I	II b	" "
STUDER, E. J.	I	V	" "
SULLIVAN, J.	I	IV	" "
SULLIVAN, J. J.	I	VI	" "
SUTHERLAND, D. W.	I	II	" "
TANNER, H. A.	I	III	" "
TETLER, H. S.	I	VI	Lawrence, Mass.
THOMAS, A.	I	VI	Lowell, Mass.
TOBIN, W.	I	II b	No. Chelmsford, Mass.
TONGE, J.	I	IV and VI	Lawrence, Mass.
TOSNEY, Z. A.	I	II b	" "
TRAVERSY, A. L.	I	VI	Lowell, Mass.
TUNNY, F. A.	I	IV	" "
TYRELL, R. J.	I	I	" "
TYRRELL, W. B.	I	I	" "
UPTON, C. A.	I	I	" "
WAINWRIGHT, J.	I	IV	" "
WALKER, H. L.	I	VI	" "
WALLACE, M. C.	I	V	" "
WATSON, J. M.	I	IV	Lawrence, Mass.
WEBSTER, J. F.	I	II a	Lowell, Mass.
WETHERBEE, S. B.	I	V	" "
WHEELER, R. L.	I	VI	" "
WHEELER, MRS. R. L.	I	III	" "
WHITNEY, J. W.	I	II a	Lawrence, Mass.
WHITNEY, J.	I	V	Lowell, Mass.
WOOD, C. E.	I	II a	Lawrence, Mass.

NAME.	YEAR.	COURSE.	ADDRESS.
WOODMAN, H. L.	1	IV	Lowell, Mass.
WRIGLEY, J. W.	1	II b	North Andover, Mass.
ABBOTT, P. E.	2	I	Lowell, Mass.
BALMFORTH, MARTHA,	2	III	No. Billerica, Mass.
BARLOW, R.	2	V	Lowell, Mass.
BARRINGTON, J.	2	IV	No. Billerica, Mass.
BARRY, E. J.	2	III	Lowell, Mass.
BASTOW, H.	2	III	Lawrence, Mass.
BINNS, H.	2	VI	Lowell, Mass.
BIXBY, W. H.	2	I	" "
BLINKHORN, R. F.	2	I	" "
BOWKER, J. W.	2	III	" "
BOWRING, G.	2	VI	" "
BURK, D. J.	2	IV	" "
BURNS, E. J.	2	IV	" "
BURNS, J. E.	2	IV	" "
COBURN, C. F.	2	IV	" "
COWDREY, C. E.	2	V	No. Billerica, Mass.
COWELL, R.	2	I	Lowell, Mass.
CREMIN, D. J.	2	I	" "
COLBURN, C. M.	2	V	Nashua, N. H.
DEARITT, J. J.	2	III	No. Billerica, Mass.
DONOVAN, D. F.	2	IV	Lawrence, Mass.
ELSTON, F. R.	2	IV	Lawrence, Mass.
FERGUSON, T.	2	V	Lowell, Mass.
FERNLEY, J. A.	2	I	" "
FLINT, J. H.	2	IV	Andover, Mass.
FORTUNE, D. A.	2	II b	Lawrence, Mass.
GAFFNEY, M. J.	2	I	Lowell, Mass.
GARNER, W.	2	III	" "
GOODCHILD, G.	2	I	" "
HADLEY, H. T.	2	II b	" "
HAWORTH, J.	2	VI	" "
HOLDEN, G.	2	V	Lawrence, Mass.
HONIKER, J. J.	2	III	" "
HOWARD, J.	2	III	Lowell, Mass.
HOYLE, E.	2	II b	" "
HUTTON, C.	2	III	" "
JACKSON, J.	2	III	" "
JENNINGS, C. S.	2	VI	" "
JENNINGS, JAMES	2	III	" "
JOHNSON, E. A.	2	II b	Lawrence, Mass.
JOYCE, P.	2	III	Lowell, Mass.
KENT, E. J.	2	I	" "
KNOWLES, F. E.	2	I	" "
LAMONT, W. M.	2	II b	Andover, Mass.
LAWLESS, A.	2	V	Lowell, Mass.
LAWRENCE, C.	2	I	" "
LEITH, ROBERT W.	2	IV	" "
LIBBY, C. R.	2	VI	" "
MacWHINNIE, A. A.	2	I	" "
MALZ, L.	2	V	Lawrence, Mass.
MARTINSON, C. W.	2	III	No. Billerica, Mass.
MASON, F. H.	2	I	Lowell, Mass.
McKEON, E. P.	2	I	" "
McNAB, J. M.	2	V	" "

NAME.	YEAR.	COURSE.	ADDRESS.
McQUADE, M. J.	2	CO	Lawrence, Mass.
MEKLEJOHN, M.	2	IV	Lowell, Mass.
MOLLOY, A.	2	V	" "
MYERS, J.	2-3	III-IV	" "
NICOL, L. A.	2	VI	" "
NOONAN, D. T.	2	III	Lawrence, Mass.
NUGENT, T. A.	2	VI	Lowell, Mass.
OSGOOD, C. F.	2	VI	" "
PALMER, G. B.	2	III	" "
PARKINSON, J. C.	2	II-b	" "
PATTEE, R. W.	2	V	" "
REYNOLDS, H. L.	2	V	" "
SALISBURY, C. A.	2	III	Lawrence, Mass.
SCHIERMERHORN, G. E.	2	I	Lowell, Mass.
SCARLOTT, G.	2	I	" "
SCHOFIELD, J. S.	2	III	Lawrence, Mass.
SMITH, W. H.	2	II b	Methuen, Mass.
STAKEM, W.	2	V	Lowell, Mass.
STEARNS, W. A.	2	I	" "
TALFORD, E. D.	2	III	" "
TONGE, M.	2	III	" "
UPTON, F. A.	2	I	" "
VARNEY, M. H.	2	III	" "
WELSH, T. F.	2	III	" "
WESSON, P. B.	2	II	" "
WHITWORTH, J.	2	V	" "
WILMOT, J.	2	III	" "
WILSON, C. E.	2	II b	Methuen, Mass.
WILSON, G. II.	2	II b	Lawrence, Mass.
WOODCOCK, T.	2	VI	Lowell, Mass.
BRAINERD, J. L.	3	I	Lawrence, Mass.
BURNHAM, F. E.	3	IV	" "
CRAIG, C. E.	3	II	Lowell, Mass.
CULLINAN, M. H.	3	I	" "
DUDLEY, G. E.	3	I	" "
DUPEE, C. F.	3	I	" "
GOOD, II.	3	I	" "
HAIGH, W.	3	I	" "
HARRIS, G. S.	3	I	" "
LEE, C.	3	I	" "
LEITH, E. E.	3	I	" "
LIBBY, C. F.	3	I	" "
LIVINGSTON, H. R.	3	I	" "
PUFFER, G. F.	3	IV	" "
STEVENSON, W.	3	III a	North Billerica, Mass.
STOKHAM, B. I.	3	IV	Lowell, Mass.
SWIFT, E. S.	3	III	" "
VOGT, A.	3	III a	Lawrence, Mass.
WALKER, D.	3	III	Collinsville, Mass.
WOOD, J.	3	I	Lowell, Mass.
BUZZELL, W. O.	P. G.	III	Methuen, Mass.
COLLIER, J.	P. G.	III	Lowell, Mass.
ELSTON, F.	P. G.	III	Lawrence, Mass.
GAUNT, A. C.	P. G.	IV	Methuen, Mass.
SAUNDERS, E. B.	P. G.	VI	Lawrence, Mass.

# SUMMARY.

Day Students	-	-	-	-	-	-	-	-	92
Evening Students	.	.	-	-	-	-	-	-	<u>379</u>
Total	-	-	-	-	-	-	-	-	471
Deduct names counted twice	-	-	-	-	-	-	-	-	<u>7</u>
									464



## CLASS OF 1902.

### Graduates with Titles of Theses.

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#### *Diplomas awarded as follows:*

T. E. RAMSDELL, B. S.	I	Housatonic, Mass.
Investigation of Combinations of Picking and Drawing Processes to Secure Evenness and Strength.		
EDWARD S. SWIFT.	<del>III</del> I	Lowell, Mass.
Comparison of Ring and Mule Spun Hosiery Yarn.		
CLARENCE E. CRAIG.	III	Lowell, Mass.
A Comparison of the English and International Systems for Numbering Yarns.		
CHARLES T. WING.	III	Lowell, Mass.
The Twist of Yarns and its Relation to the Weave.		
FRANK E. BURNHAM.	IV	Lawrence, Mass.
An Investigation of Cotton Softeners.		
ROBERT R. CARTER.	IV	Reading, Mass.
Application of Chromium to Wool using Potassium Dichromate as a Mordanting Principle.		
WALTER F. HASKELL, A. B.	IV	Westbrook, Me.
Aniline Black on Paper Stock.		

---

### Certificates for Partial Courses were Awarded as Follows:

ARTHUR F. FERGUSON.	I	Boston, Mass.
Theses with George S. Harris.		
Relation of Amounts of Twist to Breaking Strength of Cotton Yarn.		
GEO. S. HARRIS.	I	Rome, Ga.
Thesis with Arthur S. Ferguson.		
HARRY L. WOODMAN.	I	Lowell, Mass.
Comparison of Texas and Uplands Cotton.		
C. E. CURRAN.	III	Lawrence, Mass.
The Relative Effect of the Pulley and Plate Gears on the Scaife Lifter Motion, upon the shape and Density of a Filling Wind.		
BENJAMIN HOLGATE.	III	Lowell, Mass.
Original Sateen and Leno Stripe Gingham.		

## Graduates, Evening, May 15, 1902.

*Certificates were awarded as follows:*

M. H. Kelly,	Cotton Course, Three Years.
George E. Schermerhorn,	" " " "
Irving L. Brainerd,	" " " "
Henry Good,	" " " "
Daniel J. Cremin,	" " " "
Jno. Wood,	" " " "
George E. Dudley,	" " " "
Charles Lee,	" " " "
W. R. Adams,	Woolen Spinning Course, One Year.
E. Burkhard,	" " " "
Frank Donnellan,	" " " "
F. G. Forest,	" " " "
S. Rockwell,	" " " "
E. J. Kent	Worsted Spinning, Two Years' Course.
C. E. Wilson,	" " " "
G. H. Wilson,	" " " "
D. A. Fortune,	" " " "
W. H. Smith,	" " " "
E. Hoyle,	" " " "
W. A. Lamont,	" " " "
E. A. Johnson,	Woolen and Worsted Spinning Course, Three Years.
W. Haigh,	Design Course, Three Years.
E. E. Leith,	" " " "
W. Stevenson,	" " " "
M. H. Varney,	" " " "
A. H. Vogt,	" " " "
David Walker,	" " " "
W. O. Buzzell,	One Year Post Graduate Design Course.
J. J. Cheetham,	" " " "
J. Collier,	" " " "
A. C. Gaunt,	" " " "
R. Barlow,	Two Years' Weaving Course.
C. E. Cowdrey,	" " " "
T. Ferguson,	" " " "
J. Hogan,	" " " "
A. J. Lawless,	" " " "
A. Malloy,	" " " "
R. W. Potter,	" " " "
T. B. Umpleby,	" " " "
H. Binns,	Mechanical Engineering Course, Two Years.
G. P. Bowring,	" " " "
C. W. Field,	" " " "
J. Haworth,	" " " "



C. R. Libby	Mechanical Engineering Course, Two Years.
T. A. Nugent,	" " " "
C. F. Osgood,	" " " "
W. H. Stopherd,	" " " "

## Partial List of Former Day Students.

J. W. BAILEY, Atlanta, Ga.	Director Textile Dept. Georgia School of Technology.
I. WALWIN BARR, Lowell, Mass.	Instructor, Lowell Textile School.
HENRY A. BODWELL, Andover, Mass.	Assistant Supt. Smith & Dove.
RICHARD H. BRADLEY, Pawtucket, R. I.	Loomfixer, Atlantic Mills, Providence.
C. J. BRICKETT, New Bedford, Mass.	Instructor, International Correspondence School, Textile Department.
DONALD C. BUCHAN, Lowell, Mass.	Assistant Instructor Power Weaving Lowell Textile School.
KATHERINE BURRAGE, Lowell, Mass.	Teacher of Modelling, Evening Drawing School.
JOHN A. CURRIER, New Bedford City, Va.	Inspector of Textile Fabrics, Qr. Mr. Dept U. S. Army.
JAMES H. CUTTLE, Mattapan, Mass.	Assistant Designer Arlington Mills, Boston.
NATHANIEL T. EWER, East Boston, Mass.	Chemist, New York & Boston Dyewood Co., East Boston.
C. E. FOSTER, No. Andover, Mass.	Machinist, Davis & Furber Machine Co.
AMY H. GOODHUE, Lowell, Mass.	Librarian, Dracut Public Library.
WALTER F. HASKELL, Westbrook, Me.	Paper Colorist, S. D. Warren & Co.
WALTER M. HASTINGS, West Newton, Mass.	Textile Instructor American School of Correspondence.
JOSEPH J. HONIKER, Lawrence, Mass.	Sample Weaver with Geo. E. Kunhardt.
PERCEY F. KINGSBURY, Lowell, Mass.	Color Maker, Hamilton Print Works.
JNO. P. LEACH, Henderson, N. C.	Foreman Carding Department, Harriet Cotton Mills.
GEORGE F. LAMSON, Lewiston, Me.	Draughtsman, Lewiston Machine Co.
WALTER NEWTON MARINEL, McKinney, Tex.	Engineering.
J. C. MINGE, Demopolis, Ala.	Secretary and Treasurer B Minge Mfg. Co.
WM. R. MOOREHOUSE, Lowell, Mass.	Instructor Chemistry, Lowell Textile School.
B. MOORE PARKER, Raleigh, N. C.	Instructor Textile Dept. C. A. C. Clemson College.
H. C. PARKER, Fitchburg, Mass., Designer, Saxony Mills.	Asst. Supt. and Designer, S. N. & C. Russell Woolen Mills.
JOHN E. PERKINS, Pittsfield, Mass.	Instructor Lowell Textile School.
ALOIS J. PRADEL, Lowell, Mass.	Designer National and Providence Worsted Mills, Providence, R. I.
C. A. ROBINSON, Providence, R. I.	Chemist with Read, Holliday Sons.
ROBERT R. SLEEPER, New York, N. Y.	Instructor Cotton Spinning Lowell Textile School.
STEPHEN E. SMITH, Methuen, Mass.	Instructor Woolen Spinning Lowell Textile School.
ARTHUR A. STEWART, Lowell, Mass.	Clerk, Catlin & Co., Boston. Yarn Commission Business.
EDWARD S. SWIFT, Lowell, Mass.	Yarn Supt. Assabet Mills, American Woolen Company.
JAMES F. SYME, Maynard, Mass.	Dyer, Boston Rubber Shoe Co., Malden, Mass.
HENRY J. THOMPSON, Lawrence, Mass.	Chemist.
ARTHUR HAMMOND WEBBER, Beverly, Mass.	Designer Middlesex Co.
CHARLES T. WING, Lowell, Mass.	Instructor Art Department, Lowell Textile School.
IDA A. WOODIES, Lowell, Mass.	

## List of Past Students, Evening.

HEATON BINNS, Lowell, Mass.	Overseer, Bigelow Carpet Co.
JAS. T. BROADBENT, New Bedford, Mass.	Inst. in Carding and Spinning, New Bedford Textile School.
PAUL C. BURKHARDT, Dracut, Mass.	Second Hand, Merrimac Woolen Mills.
WILLIAM O. BUZZELL, New Bedford, Mass.	Weaver, Acushnet Mills, New Bedford, Mass.
ALBERT D. CAMPBELL, Methuen, Mass.	Section Hand.
ALBERT B. CAWTHRA, Wigginvillle, Mass.	Spinner, U. S. Bunting Co.
ERNEST W. CHIPPENDALE, Lowell, Mass.	Second Hand, Comber.
JOHN J. CHEETHAM, Lowell, Mass.	Overseer, Mule Spinning Massachusetts Mills.
ARTHUR D. COLBY, Lowell, Mass.	Foreman Carding Dept. Lowell Machine Shop.
JOHN COLLIER, No. Chelmsford, Mass.	Overseer of Weaving.
HENRY H. CROMPTON, Methuen, Mass.	Arlington Mills, Second Hand, French Drawing.
MICHAEL H. CULLINAN, Boston, Mass.	Cotton Carder.
HENRY DAVIS, Lowell.	Worsted Carder, U. S. Bunting Co.
JAMES DONNELLY, Lowell, Mass.	Ass't Second Hand, Mule Room.
DANIEL F. DONOVAN, No. Andover Depot,	Second Hand, M. F. Stevens Co., Card Room.
FRED R. ELSTON, Fitchburg, Mass.	Designer, Nockeage Mills.
WILLIAM A. EVISON, Lowell, Mass.	Weaving.
THOS. FARRÉLL, Lowell, Mass.	Woolen Spinning.
WILLIAM FRAME, Lowell, Mass.	Loomfixer.
JOHN H. GAGAN, Lowell, Mass.	Overseer of Grey Room, Stirling Mills, Lowell
ALFRED C. GAUNT, Methuen, Mass.	Designer with Tremont Worsted Company Methuen, Mass.
ARCHIBALD GRANT, Lowell, Mass.	Section Spinning and Twisting.
MICHAEL GROURKE, Lowell, Mass.	Section of Wool Combing.
DANIEL HILL, Sanford, Me.	Worsted Spinner, Maine Alpaca Mills. Springvale, Maine
THOMAS B. HITCHCOCK, Lowell, Mass.	Overseer Waste Carding and Spinning, Tremont & Suffolk Mills.
JOHN HOWARD, Lowell, Mass.	Overseer of Weaving.
RALPH HUNTER, West Medford Mass.	Clerk.
CLARENCE HUTTON, Lowell, Mass.	Boss Weaver, N. E. Bunting Co.
WM. J. JONES, Lowell, Mass.	Overseer Worsted Spinning.
IRVINE KELLET, Lawrence, Mass.	Second Hand Worsted Spinning, Lower Pacific Mills.
WALTER KILLERBY, Lowell, Mass.	Overseer Worsted Yarn Mill.
ALFRED LAW, Methuen, Mass.	Section Hand.
WILFRED LAW, Lawrence, Mass.	Designer, Assistant Lower Pacific Mills.
HARRY MADEN, Lowell, Mass.	Second Hand.
ISAIAH D. MARJERISON, Lawrence, Mass.	Section Hand, Wool Combing, Arlington Mills.
ALEXANDER MARSHALL, Methuen, Mass.	Assistant Designer, Arlington Mills.
J. W. McALLISTER, Worthville, V. C.	Sec. and Treas. Worth Mfg. Co.
HUGH B. McQUADE.	Weaver.
ALEXANDER L. MOIR, Lowell, Mass.	Letter Carrier.
FRANK MORRIS, Lowell, Mass.	Loomfixer.
ERNEST H. NELSON, Lowell, Mass.	Overseer of Carding.
JOHN T. NOBLE, Lowell, Mass.	Bookkeeper, Walsh Mill.
THOMAS A. NUGENT, Lowell, Mass.	Second Hand, Bigelow Carpet Co., Lowell.

SAMUEL A. OGLEY, E. Chelmsford, Mass.	Spinner, G. E. Moore's Mills, N. Chelmsford.
CHAS. F. OSGOOD, Lowell, Mass.	Draughtsman, Lowell Machine Shop.
WILLIAM OXLEY, Oxford Chem. Co. N. S.	Oxford Manufacturing Co., Ltd.
HUDSON, PEEL, Lawrence, Mass.	Section Hand Spinning.
H. EDWARD PICKERING, Lowell, Mass.	Asst. Supt. Pickering Mfg. Co.
HIRAM L. REYNOLDS, Lowell, Mass.	Second Hand, Card Rooms, Merrimac Mills.
H. C. ROWELL, Lowell, Mass.	Draftsman, Lowell Machine Shop.
EDWARD B. SAUNDERS, Fall River, Mass.	Loom Fixer.
EDWARD B. SCANLON, Lawrence, Mass.	Section Hand Combing, Arlington Mills.
PHILIP SHANNON, Lowell, Mass.	Weaver, Middlesex Mill.
A. E. SILCOX, Lowell, Mass.	Draftsman.
FRED SMITH, Lawrence, Mass.	Second Hand Spinning.
FRED L. SNOW, Lowell, Mass.	Overseer, Dyeing and Bleaching, Lawrence Mfg. Co.
E. H. SPEDDING, Lowell, Mass.	Second Hand Weaving, Tremont and Suffolk Mills.
WM. STEVENSON, North Billerica, Mass.	Second Hand, Wool Dept.
W. H. STOPHERD, Lowell, Mass.	Overseer Carding Combing and Spinning, Bigelow Carpet Co.
THOMAS B. UMPLEBY, Woonsocket, R. I.	Supt. and Designer River Weaving Co.
PAUL B. WESSON, Lowell, Mass.	Foreman Lowell Machine Shop.
BENNETT WHITEHEAD, Methuen, Mass.	Spinning Section Hand.
FRANK S. WILLEY, Lawrence, Mass.	Second Hand, Carding.
ISAAC F. WILLIAMSON, Lowell, Mass.	Second Hand, Dye House.
WILLIAM WILMOT, Hamilton, R. I.	Designer for Hamilton Web Co.
GEORGE H. WILTON, No Andover, Mass.	Overseer of Designing Room, Stevens Mills.
W. SANFORD WOODBURY, Millville, N. J.	Overseer of Carding.

## Contributions.

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Contributions or loans of machinery, apparatus or material, kindnesses extended or assistance rendered by the following firms or persons are acknowledged with thanks :—

Actien Gesellschaft fur Anilin Fabrikaten, Berlin.

Altemus, W. W., Philadelphia, Pa.

Ameledema Oilless Bearing Co., Philadelphia, Pa.

American Card Clothing Co., Lowell, Mass.

American Crayon Co., Lowell, Mass.

American Drosophore Co., Boston, Mass.

American Loom Co., Readville, Mass.

American Steel Wire Co., New York.

American Woolen Co., Boston, Mass.

Amraytoon Tube Co., Lowell, Mass.

Appleton Co., Lowell, Mass.

Arabol Mfg. Co., New York City.

Arlington Mills, Lawrence, Mass.

Atlas Mfg. Co., Newark, N. J.

Atwood Machine Co., Stonington, Conn.

Avery Chemical Co., Littleton, Mass.

Badische Anilin und Soda Fabrik, Germany.

Barber & Colman, Boston, Mass.

Barbour Bros., Boston, Mass.

Bartlett & Dow, Lowell, Mass.

Battles, J., Lawrence, Mass.

Bay State Mills, Lowell, Mass.

Beach & Co., Hartford, Conn.

Bennett, Frank P., Boston, Mass.

Berry, A. Hun, Boston, Mass.

Bigelow Carpet Co., Lowell, Mass.

Boott Mills, Lowell, Mass.

Boston Globe, Boston, Mass.

Boston Herald, Boston, Mass.

Boston Journal of Commerce, Boston, Mass.

Boston Transcript, Boston, Mass.

Brightwood Mfg. Co., No. Andover, Mass.

British Alizarin Co., England.

Brown, Wm. H., Worcester, Mass.

Cameron & Co., A. J., Boston, Mass.

Capron, C. C., Uxbridge, Mass.

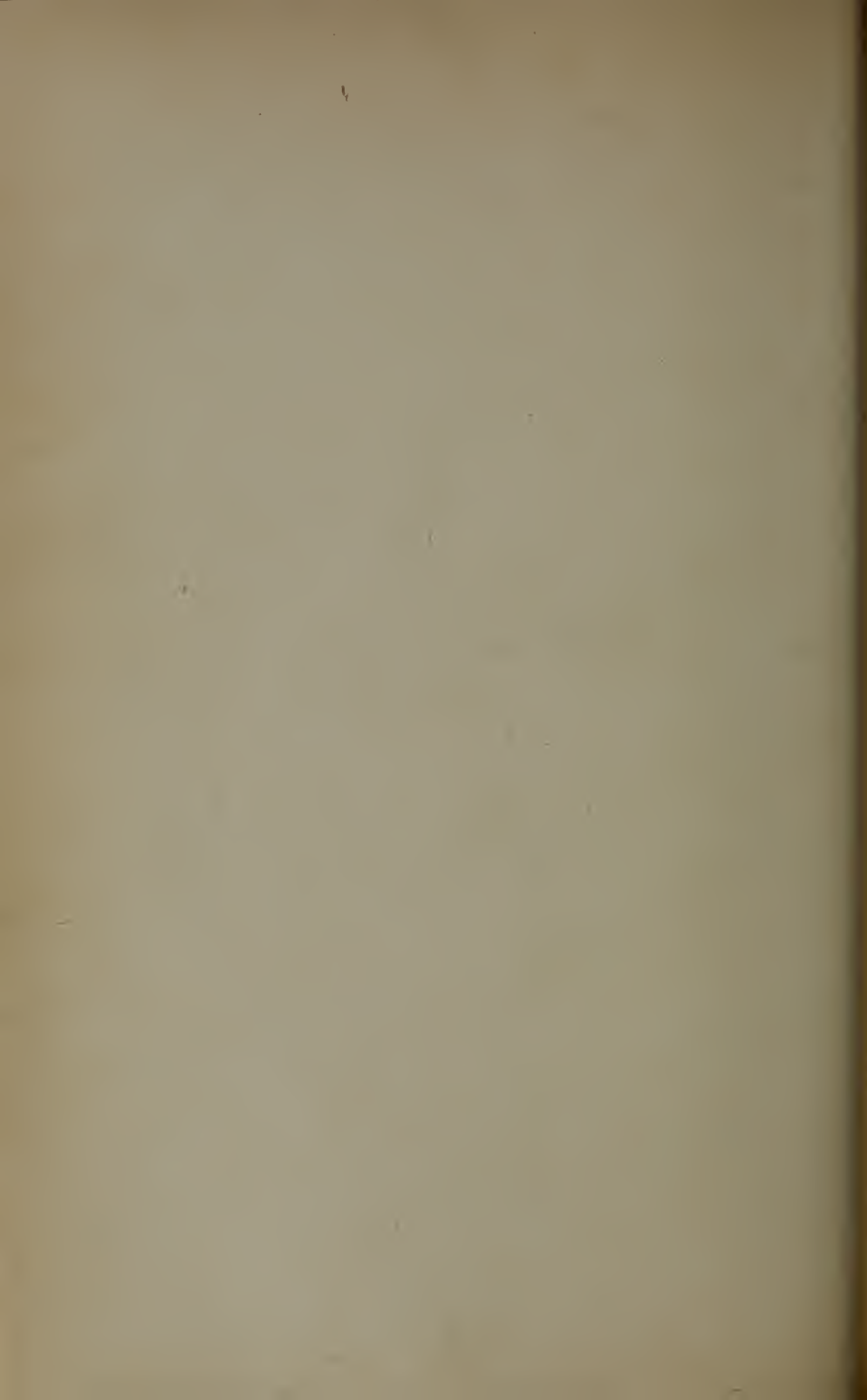
Carruthers, Robert, Lowell, Mass.  
 Carey, W. W., Lowell, Mass.  
 Chase, Geo. S., Boston, Mass.  
 Clark, Jeremiah, Lowell, Mass.  
 Coats, J. & P., Pawtucket, R. I.  
 Coburn, C. B. & Co., Lowell, Mass.  
 Coburn Shuttle Co., Lowell, Mass.  
 Commercial Bulletin, Boston, Mass.  
 Consolidated Prior Cotton Gin & Wool Burrel Co., London, Eng.  
 Crompton-Knowles Loom Works, Worcester, Mass., and Providence, R. I.  
 Davis & Furber Machine Co., North Andover Depot, Mass.  
 Derby & Morse, Lowell, Mass.  
 Draper Co., Hopedale, Mass.  
 Dry Goods Economist, New York.  
 Entwistle, T. C., Lowell, Mass.  
 Emmons Loom Harness Co., Lawrence, Mass.  
 Factory Insurance Association, Hartford, Conn.  
 Farbenfabriken of Elberfeld Co., New York.  
 Fibre & Fabric, Boston, Mass.  
 Firth, Wm., Boston, Mass.  
 Furbush Machine Co., Philadelphia, Pa.  
 Gates, J. & Son, Lowell, Mass.  
 General Fire Extinguisher Co., Providence, R. I.  
 Gherli, A., New York.  
 Gilbert Manufacturing Co., Gilbertville, Mass.  
 Gilbert Loom Co., Worcester, Mass.  
 Grundy, J. R., Philadelphia, Pa.  
 Guild & Lord, Boston, Mass.  
 Grasselli Chemical Co., Cleveland, O.  
 Hamilton Mills, Lowell, Mass.  
 Hamilton Print Works, Lowell, Mass.  
 Hampton Co., Easthampton, Mass.  
 Harris, G. W., Lowell, Mass.  
 Harwood, G. S. & Son, Boston, Mass.  
 Holyoke Machine Co., Worcester, Mass.  
 Howard Bros., Worcester, Mass.  
 Haworth & Watson, Lowell, Mass.  
 Jaques Shuttle Co., Lowell, Mass.  
 Johns, H. W. & Co., New York.  
 Kalle & Co., New York.  
 Kalle & Co., Boston, Mass.  
 Kittredge, H. G., Boston, Mass.  
 Kitson Machine Co., Lowell, Mass.  
 Klipstein, A., New York.  
 Knowles Loom Works, Worcester, Mass.

Laminar Fibre Co., Cambridge, Mass.  
 Lawrence Manufacturing Co., Lowell, Mass.  
 Leominster Woolen Co., Leominster, Mass.  
 Leopold, Cassella, Germany.  
 Lewiston Machine Co., Lewiston, Me.  
 Leyland Belting Co., Lawrence, Mass.  
 Lowell Manufacturing Co., Lowell, Mass.  
 Lowell Machine Shop, Lowell, Mass.  
 Main Belting Co., Boston, Mass.  
 Massachusetts Co., Lowell, Mass.  
 Massachusetts Machine Plush Co.  
 Mason Machine Works, Taunton, Mass.  
 Merrimack Mfg. Co., Lowell, Mass.  
 Mather & Platt, England.  
 Mathieson, W. J. & Co., Boston, Mass.  
 Mauger & Avery, Boston, Mass.  
 Mayo Knitting Machine Co., Franklin, N. H.  
 Meister, Lucius & Brunning, Germany.  
 Metallic Drawing Roll Co., Indian Orchard, Mass.  
 Montgomery, J. R. & Co., Windsor, Conn.  
 Moore's Mills, North Chelmsford, Mass.  
 Nat. Assn. of Wool Mfrs., Boston, Mass.  
 New England Bunting Co., Lowell, Mass.  
 N. E. Cotton Mfrs. Assn., Boston, Mass.  
 New York & Boston Dyewood Co., Boston, Mass.  
 Nichol, W. G., Chester, S. C.  
 Olney Bros., Providence, R. I.  
 Pacific Mills, Lawrence, Mass.  
 Parker, W. H. & Sons, Lowell, Mass.  
 Parks & Woolson, Winchester, Vt.  
 Perry, O. H., Lowell, Mass.  
 Phillips & Co., Providence, R. I.  
 Pickering Knitting Co., Lowell, Mass.  
 Pickhardt & Kuttroff, Boston, Mass.  
 Pocasset Worsted Co., Thornton, R. I.  
 Prince, Smith & Son, Keighly, England.  
 Read, Holiday & Co., Boston, Mass.  
 Rodney Hunt Machine Co., Orange, Mass.  
 Roy, B. S., Worcester, Mass.  
 Royle, John & Son, Paterson, N. J.  
 Roessler & Hasslacher Chemical Co., New York.  
 Sargent's Sons, C. G., Graniteville, Mass.  
 Schoelkopp Aniline & Chemical Co., Buffalo, N. Y.  
 Shaw Stocking Co., Lowell, Mass.  
 Star Worsted Co., Fitchburg, Mass.



Steel Heddle Co., Philadelphia, Pa.  
 Stevens, M. T. & Sons, No. Andover, Mass.  
 Stirling Mills, Lowell, Mass.  
 Stoddard, Haserick & Richards, Boston, Mass.  
 Sturtevant, B. F. Co., Jamaica Plain, Mass.  
 Sullivan Machinery Co., Claremont, N. H.  
 Talbot Mills, North Billerica, Mass.  
 Talbot Dyewood & Chemical Co., Lowell, Mass.  
 Textile Excelsior, Charlotte, N. C.  
 Textile Manufacturers Journal, New York.  
 Textile World, Boston, Mass.  
 Thompson Hardware Co., Lowell, Mass.  
 Tillinghast, Stiles & Co., Providence, R. I.  
 Tolhurst, W. H. & Son, Troy, N. Y.  
 Torrence Mfg. Co., Harrison, N. J.  
 Tremont & Suffolk Mills, Lowell, Mass.  
 Tucke & Parker, Lowell, Mass.  
 Union Shuttle Co., Lawrence, Mass.  
 United States Aerophor Air Moistening Co., Providence, R. I.  
 United States Bunting Co., Lowell, Mass.  
 United States Bobbin & Shuttle Co., Providence, R. I.  
 Universal Winding Co., Boston, Mass.  
 Victor, Koechl & Co., Boston, Mass.  
 Wade, J. M., Boston, Mass.  
 Warren Mills, Centreville, R. I.  
 Washington Mills, Lawrence, Mass.  
 Wattles, L. R., Canton Junction, Mass.  
 Whiting, Henry F., Lowell, Mass.  
 Whitin Machine Works, Whitinsville, Mass.  
 Whitely, John & Son, Halifax, England.  
 Williams Roving Carrier Co., Naugatauck, Mass.  
 Wool & Cotton Reporter, Boston, Mass.  
 Woodley, Soap Manufacturing Co., Foxboro, Mass.





Fill out and send to Wm. W. Crosby, Principal

# Lowell Textile School,

LOWELL, MASS.

## APPLICATION BLANK.

Date .....

I, ..... hereby  
apply for admission to the Lowell Textile School as <sup>DAY</sup>  
student. <sup>EVENING</sup>

Name in Full, .....

Date and Place of Birth, .....

Home Residence, .....

Parent or Guardian, .....

Residence, .....

School last attended, .....

(INDICATE COURSE.)

DAY {	I. Cotton Manufacturing.	EVEN- ING {	I. Cotton Spinning.
	II. Wool Manufacturing.		II. Woolen and Worsted Spinning
	III. Designing.		III. Designing.
	IV. Chemistry and Dyeing.		IV. Chemistry and Dyeing.
	V. Weaving.		V. Weaving.
			VI. Mechanical Engineering.

Signature, .....

ENDORSEMENT BY SOME OFFICER OF SCHOOL LAST ATTENDED.

I, ..... Principal of the

..... School, located at .....

hereby certify that  
the above applicant is duly qualified to pursue with profit the  
work of the Lowell Textile School.

SIGNED: .....



SERIES 5, No. 2.

NOVEMBER, 1902.

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BULLETIN

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OF THE

Lowell Textile School

LOWELL, MASS., U. S. A.

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ISSUED QUARTERLY

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Moody Street and Colonial Avenue

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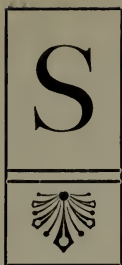




*Lockwood, Greene and Co.,  
Architects and Engineers,  
Boston, Mass.*

## SOUTHWICK HALL

GENERAL ADMINISTRATION AND CHEMISTRY, DYEING, FINISHING, MECHANICAL AND ELECTRICAL ENGINEERING,  
DESIGN, DECORATIVE ART, AND COMMERCIAL DEPARTMENTS



SINCE the issue of our last bulletin, there has been one change in the Staff of Instructors. Mr. Philip R. French, instructor in General Chemistry and Quantitative Analysis, has resigned his position to take charge of the Dyeing Department of the North Carolina College, of Mechanical Arts, West Raleigh, N. C. Mr. W. W. Braman, a graduate of Worcester Polytechnic Institute, and recently Instructor in Chemistry in the New Hampshire State College, has been appointed to this place.

The new course in electricity, as announced in the last bulletin, in charge of Mr. E. E. Nelson, a graduate of Massachusetts Institute of Technology, has been successfully launched, and the field for the application of this important agent broadens fast as the work proceeds.

The fall term of the school has now opened and with it has come the largest registration known in the history of the school, there being 521 in all, 111 in the day school and 410 at night. The present quarters of the school are quite overcrowded by such large numbers, and it is the intention to move at the beginning of the new year to the new buildings which are now ready for occupancy. As each year goes by, new conditions are met in the manufacturing industries with which the school endeavors to keep pace. All these advances mean the addition of apparatus and space in order that the students may be trained to go out into active work. No department in the school is now more crowded than the chemistry and dyeing. Hitherto, only those taking the regular chemistry and dyeing course could do laboratory work in dyeing; the work for those taking the general chemistry course being confined to lectures and demonstrations in the lecture room. As laboratory work is considered to be of so much importance, arrangements are made to carry this out in our new laboratories. When the student is brought into personal contact with the physical and chemical characteristics of the many elements used in finishing and dyeing, the lessons are more surely learned and can then be applied in actual practice to a much greater advantage. The demonstrations on the lecture table are always well planned and illustrate to a nicety what the lecturer wishes, but it is much too easy for the student to see and not understand what is going on before him. When these same experiments must be performed by him at the bench, a multitude of deviations may occur, any one of which would throw out his results and only by going through these various steps, can the student be made to realize how carefully all his senses must be trained and brought to bear upon his work if he would be master of it.



KITSON HALL  
COTTON YARN DEPARTMENT

The basement of the Chemistry wing will be given up to the operations of dyeing and finishing on a commercial scale and will include such tubs and bowls as may be necessary for dyeing skeins, raw stock and piece goods as well as bleaching, carbonizing, and wool scouring.

On the second floor will be the principal chemical lecture room. In this room the seats are arranged in raised tiers so that a clear view may be had of the lecture table, which will be fitted up with hoods and all conveniences for demonstrating. The principal stock room will be located on this floor, from which may be distributed the supplies for the chemical departments. Here also are to be found the principal office of the chemical department, the chemical museum, the private laboratory where work may be prepared for the classes, and also the dyeing laboratory.

On the upper floor are located the general chemistry and quantitative analysis laboratories, combustion room, balance room fitted with solid brick piers, and the Instructor's room. Particular pains have been taken to secure the best of ventilation for this department, first : by providing a flue in each pilaster to permit the escape of the air which is blown into the building by the heating and ventilating system ; second : by providing hoods with exhaust fans which are connected to a large brick stack in the centre of the building.

The increase of space may best be noted by the following statistics : Present floor space in the old building by the Chemistry and Dyeing Department, 2500 sq. ft. ; in the new school, 20,000 sq. ft., nearly ten times as much. In all there will be over 2 acres of floor space in the new school, as contrasted with 25,000 sq. ft. in the present quarters.

A modern system of electric transmission is to be installed. The former bulletin announced the installation of 200 horse power Stirling Boilers, and now it has been decided to put in a 125 horse power Payne engine direct connected to a 75 K. W. generator to deliver direct current at 220 volts. This current will supply both motors and lights. There is a general tendency among engineers to use the alternating current, but the direct current is chosen for this plant because of the facilities afforded experimentally such as changing speeds, electrolysis, stereoptican, etc. The 220 volt current is not dangerous and yet allows the use of a reasonably small amount of copper for its transmission. The system will be very instructive because the exhaust steam from the engine is to be used in the heater which warms both Kitson Hall and the Falmouth Street building, and the students may study the action of a thoroughly modern installation.





FALMOUTH STREET BUILDING  
WEAVING, AND WOOLEN AND WORSTED SPINNING DEPARTMENTS

For such time as the boilers are not under steam or for a heavy load, a 50 horse power gas engine, a gift of the Lowell Gas Light Company, is to be installed, direct connected to a 30 K. W. generator.

The following additional gifts of machinery are to be reported :—

- 1 Reel Dyeing Machine, Rodney Hunt Company.
- 1 Set of Falling Stocks, Rodney Hunt Machine Company.
- 1 Rotary Press, George W. Voelkner and Company.

For the Cotton Department the following machines from the Lowell Machine Shop are reported :—

- 2 Revolving Flat Cards.
- 1 Railway Head.
- 1 Drawing Frame.
- 1 Intermediate Fly Frame.
- 1 Warp Spinning Frame.
- 1 Twister.
- 1 Spooler.
- 1 Filling Spinning Frame.
- 1 Yarn Reel.

For the weaving department :—

- 2 Looms from Kilburn and Lincoln, Fall River, Mass.

For the Woolen and Worsted Spinning Department :—

1 additional Set of Cards from Davis and Furber, North Andover, Mass., and the following Worsted Spinning machinery from the Lowell Machine Shop :—

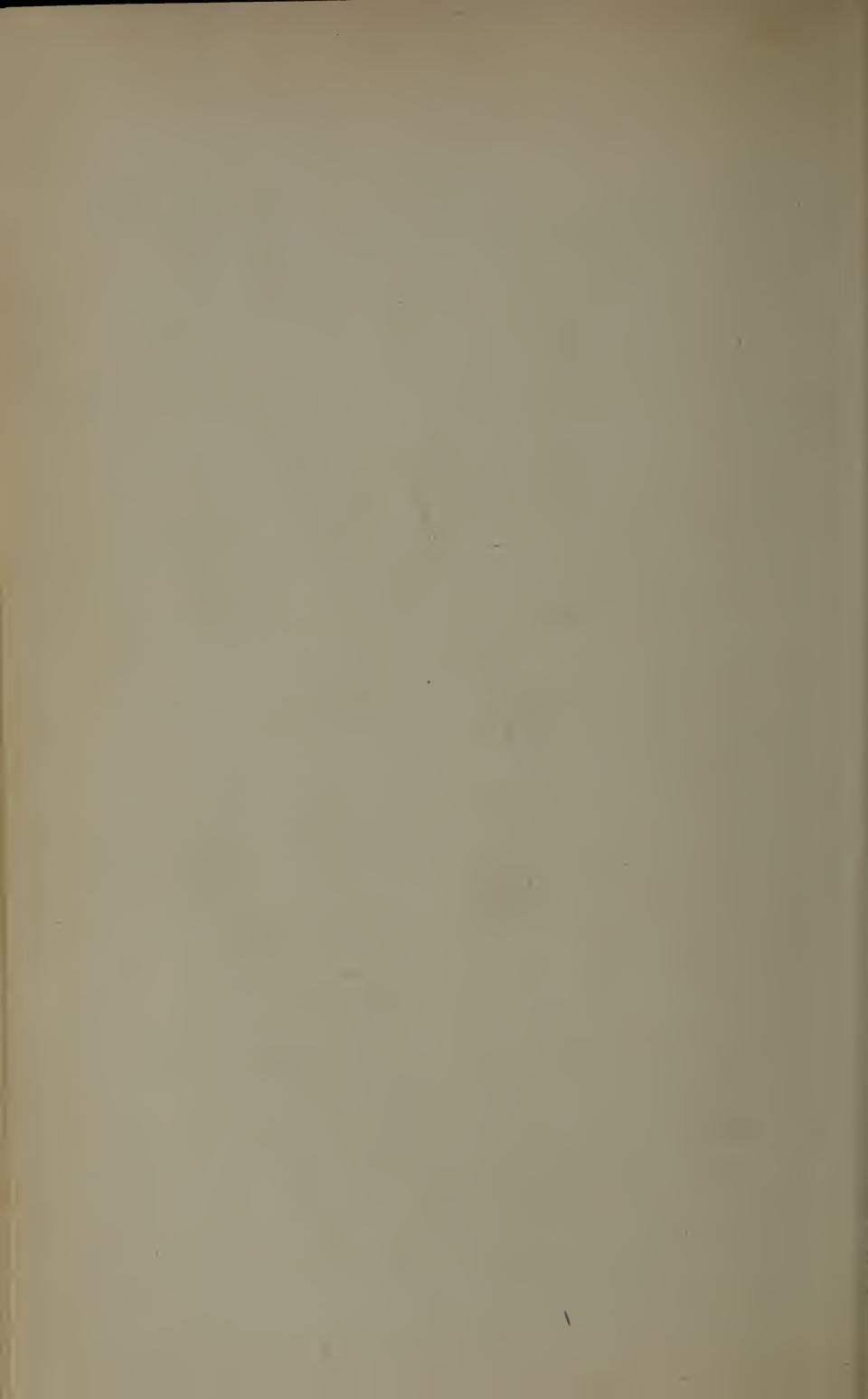
- 1 Single Balling Gill Box, with double set of Fallers.
- 1 Single Can Gill Box.
- 1 Two-Spindle Drawing Box.
- 1 Cone Reducer, 6 Spindles.
- 1 Cone Rover, 8 Spindles.
- 1 Second-Finisher, 9 Spindles.
- 1 Rover, 24 Spindles.
- 1 Cap Spinning Frame, 48 Spindles, 4" front roller.
- 1 Cap Spinning Frame, 48 Spindles, 3" front roller.
- 1 Three-Ply Boyd Trap Twister, 48 Spindles.

From C. G. Sargent and Sons, Graniteville, Mass :—

One 10 ft. and one 17 ft. Wool Scouring Bowl, fitted with their latest improved parallel rake motion ; also a one section dryer, from the same firm.

1 600 hook Jacquard Head from Thomas Halton's Sons, Philadelphia, Pa.





SERIES 6, No. 3

FEBRUARY 1903

# BULLETIN

OF THE

# Lowell Textile School

LOWELL, MASS., U. S. A.



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ISSUED QUARTERLY.

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Moody Street and Colonial Avenue.

Nearly every one is brought at some time or other to answer the question "What shall I undertake for my life work?" It is true that many drift from one position to another and would have it appear that they are powerless to change the state of affairs. Whatever may have been true in the past, it is safe to say that today, young people starting out in life have great opportunity to choose such a line of work as may be congenial to them. The general laws have provided for the primary training, making a minimum amount, at least, obligatory and there are many funds at the disposal of those having proper mental capacity to enable them to pursue more extended courses of study if their own resources are insufficient. It is recognized on all hands that the trained man is the most valuable and he is always in demand. There has been a lack of provision for thorough technical training, but now this lack is rapidly being supplied.

Until within comparatively recent times, except in a very few lines it has been regarded as sufficient if the elementary branches of learning were acquired and the special forms left to the actual contact with the business of everyday life. This might do very well if the young man of today could take up the problems where his father took them up; but he is required to take them up where his father leaves them and it is well known that our progress depends upon the carrying out of ideas already developed.

A hundred years ago all that was known of engineering could have been printed in a very small book, while today the researches in this great field fill libraries. The step from the bubbling tea-kettle lid and simple engine of Watt to a modern multiple expansion condensing engine which replaces the water-fall and is the very heart of our manufacturing of today is great and to the young man of today who must take up the problem with the engine developed to its present height, there are many details which must be mastered before he can even start.

A nation which produced nothing either from mines, from soil or by the processes of manufacturing, would indeed be in a pitiable condition. We have today the striking example of our own nation forging to the front in the world's affairs and chiefly on account of its ability and success in the productive line, and here particular attention should be directed to the manufacturing side. The relation of education to production is a most important one. Dr. Dabney, President of the University of Tennessee has made a very able comparison along this line. Among other things he compares the amount of money spent in Massachusetts upon the education of each inhabitant and the productive capacity of each, with similar figures for the United States as a whole and also with the State of Tennessee as follows per report of 1898-99.

Average school period of each inhabitant :

Massachusetts	7	years
United States	4.4	"
Tennessee	3	"

The annual production :

Massachusetts	\$260	per capita a year or about \$	.85	a day.
United States	170	"	"	.55 "
Tennessee	116	"	"	.38 "

Another way to express it is to say that the average family of five in Tennessee must live on \$580 a year, counting every thing produced on the farm and in the home, as well as sales and money wages; while the same family in Massachusetts has \$1,300 a year to spend, and the average family of the United States has \$850.

Put these facts together, and we at once see their tremendous significance. The proportion between the school period in Massachusetts, the whole United States and in Tennessee, is expressed by the figures 14, 8.8 and 6. The proportion between the productive capacity of each person in Massachusetts, in the whole United States and in Tennessee is expressed by the figures 13, 8.5, and 5.8. This is practically constant ratio.

*Education is as 14 in Massachusetts to 8.8 in United States and 6 in Tennessee.*

*Production is as 13 in Massachusetts to 8.5 in the United States and 5.8 in Tennessee.*

Having then in mind that the higher training should be aided by thorough preliminary work and that a mere general training without specific application is, if not fruitless, at least a slow method of advance, it may be worth while to consider certain forms of specialized training as exemplified by recent developments, remembering the position of Massachusetts as noted in the quotations from Dr. Dabney.

The textile industry is the leading industry of the Commonwealth of Massachusetts. In its actual operation there is embarked a large proportion of the capital of the state which taken together with the allied industries, makes for the comfort and happiness of all its people. Machinery used in the conversion of cotton, wool, silk, linen, etc., into finished fabrics ready for use, has been developed within a comparatively short time, and improvements crowd each other so fast that machines are thrown away long before they are worn out because they cannot compete with the newer ones. As the fineness and diversity of product increases the application of effort is noted in an ever increasing ratio and it has become necessary to establish the textile school to assist in meeting the situation.

The Lowell Textile School is now provided with a most extensive equipment. The buildings are located on a lot of land nearly 10 acres in extent, providing for light, freedom, and room for growth. It already has buildings with more than 2 acres of floor space and in the near future will add still more to house the necessary increase of machinery. It provides courses of instruction for those who wish to enter the field of one of the most important industries, not merely of this Commonwealth, but of the world, where the opportunity for high grade individual work is boundless.

The training of the average high school is excellent as preparation to enter the work of the Lowell Textile School. If there is any particular opening in view that is a guide in the selection of the special course to be pursued at this school. If not, as is the case with most young men and women, the first half of the freshman year may be devoted to the general course. This brings the student into contact with several phases of the industry and enables an intelligent choice to be made. The courses are as follows:—

- Cotton Manufacturing.
- Wool Manufacturing.
- Designing, General Course.
- Chemistry and Dyeing.
- Weaving.
- Decorative Art, Sketching, etc.
- Mechanical and Electrical Engineering.

Of these the course usually followed by women is that in textile designing and decorative art. Along these lines are to be found good situations for women and many inquiries have been received during the past year for women who may have had this training. It should be added that more requests have been made from manufacturers for young men who have had some special training in the textile line than there were young men to supply. The courses of study are essentially along the general lines of engineering and the general sciences, such as mechanics, heat, light, electricity, chemistry, etc., and supply the foundation on which the courses are built, the end being to teach by class room and lecture instruction supplemented by laboratory work at the bench and upon modern machinery such as is used in actual manufacturing in all the necessary processes.

Further information with complete tabulation of courses may be had on application to the Principal.

**WM. W. CROSBY,**

Care of Lowell Textile School,

Lowell, Mass.

SERIES 6, No. 4

MAY, 1903

# BULLETIN

OF THE

# Lowell Textile School

Lowell, Massachusetts, U. S. A.



Permanent Home Dedication Number.

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*ISSUED QUARTERLY.*

Entered at the Post Office at Lowell, Mass.,  
as second class matter.

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Moody Street and Colonial Avenue.

*Address inquiries to WM. W. CROSBY, Principal.*





SOUTHWICK HALL

## PROCEEDINGS AT DEDICATION OF NEW HOME BUILDINGS,

FEBRUARY 12, 1903.

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When His Excellency Governor John L. Bates, accompanied by members of the Legislature and the leading representatives of the textile industries, and of the great educational institutions of the Commonwealth arrived on their special train from Boston, and were conveyed in special cars to the site of the new Lowell Textile school on Moody street, they saw the largest school of its kind in the country, and the largest poly-textile school in the world, properly housed in commodious and imposing buildings, newly completed for its occupancy. The situation of the new school is as nearly perfect as a building site can be, designed for permanent use as an educational institution. While easily accessible to the city, it is isolated to a degree that insures its permanent freedom from encroachment upon its light or air, and it commands a beautiful view of the river, having also facilities for rowing, canoeing and other out-door exercise. The land on the east, sloping down to the river, is forever to be kept open, and on the west extending to Riverside street is owned by the school, and is being graded for an athletic practice ground, the whole site comprising over ten acres. On the north, parallel with Moody street, is Falmouth street, and beyond play grounds.

On the arrival of the guests, numbering one hundred and fifty, from Boston, the first exercises in connection with the dedication of the new buildings took place. A large American flag, made and presented by the New England Bunting Company, was unfurled, with appropriate ceremony. The flag-pole, which is erected in the centre of Southwick Hall, was presented by Mr. Amasa Pratt, the iron supports by the H. R. Barker Co., and the hardware fittings by the Thompson Hardware Company.



KITSON HALL

The flag was unfurled by Principal W. W. Crosby of the school, at the moment that Governor Bates stepped from the car in front of Southwick Hall, Bugler Ralph MacBrayne sounding the bugle call "To the Color" as a signal and salute.

An official inspection of the buildings, open only to the Boston guests, the city officials of Lowell and Lawrence and the representatives of the press, occupied about two hours. They comprise Southwick Hall, Kitson Hall and the Falmouth street building not yet named. Southwick Hall is named from the maternal ancestor of Frederick Fanning Ayer, Esquire, of New York City, a native of Lowell, who has contributed \$100,000 to the school.

It is 80 by 260 feet with a central mass of three stories and basement and wings of two stories with basement under all. One half is devoted to chemistry and dyeing and the remainder to general offices, mechanical and electrical engineering, decorative art, textile design and finishing. A high archway through the centre affords access to both wings and to the general court around which the school buildings are grouped.

Kitson Hall, forming a right angle with Southwick Hall is the gift of Charlotte P. Kitson and Emma K. Stott, daughters of Richard Kitson, the founder of the Kitson Machine Company, the Company also liberally contributing. A handsome bronze tablet records that it is erected as a memorial to Richard Kitson. The building is 60 by 275 feet, one story and basement, devoted mainly to cotton yarn making with a modern heating, power and ventilating plant in the easterly end.

The Falmouth street building so far as completed and occupied is of two stories, 75 by 130 feet, and is devoted to woolen and worsted yarn making and weaving. It will be completed in 1903 by the addition of a head house 70 by 80 feet, with three stories and basement. All the buildings are faced outside and trimmed inside with buff pressed brick and are substantially constructed by Lockwood, Greene & Co., architects and mill engineers, 93 Federal Street, Boston.

The present estimated value of the plant is : land \$100,000, equipment \$100,000, and buildings \$225,000. The equipment now that floor space is available is rapidly being augmented.

An official inspection of the buildings by the Boston guests, the city officials of Lowell and Lawrence and the representatives of the press, occupied about two hours. At 1.30 p. m. other invited guests were admitted and at 2.30 the formal dedicatory exercises were opened in the main lecture hall before an audience of some five hundred leading citizens of the Commonwealth.

Trustee Franklin W. Hobbs, chairman of the committee on dedication, called the assembly to attention and said :—

“As chairman of the committee on the dedication of the new buildings, and one of the trustees on the part of the Commonwealth, it becomes my duty and privilege to call this meeting to order. We are met together today to dedicate these new buildings to the uses of the Lowell Textile School, and I wish to impress on you all that although this school is located in Lowell, it is not only a local, but a State institution as well. With this idea in view, we have always aimed to have our trustees represent various parts of the State, and especially is this true of the neighboring city of Lawrence, where many of our students live.

“It seemed fitting, therefore, to invite as one of our guests, a member of the distinguished family for whom that city was named, and it is a great pleasure and honor to have with us today the Rt. Rev. William Lawrence, D. D., Bishop of Massachusetts, whom I now invite to pronounce an invocation.”

The proceedings were then as follows :—

The Chairman : “The City of Lowell and the State of Massachusetts founded the Lowell Textile School. The Mayor of Lowell, the Chairman of the Board of Aldermen, the President of the Common Council, the Superintendent of schools, and a member of the Lowell Textile Council, are all ex-officio members of the Board of Trustees. The city has always taken an active interest in the success of this school, and has gladly joined with the State in its support, and contributed to its welfare.

“I take pleasure in presenting one who needs no introduction to a Lowell audience, His Honor, Charles E. Howe, Mayor of the City of Lowell.



Mayor Howe said : “ Mr. Chairman, Ladies and Gentlemen— It gives me great pleasure, in behalf of the City of Lowell, to welcome here today, His Excellency, our Governor, his suite and all others who have gathered to help to celebrate the passing of a new mile-stone in the progress of our manufacturing, business and educational interests. These splendid buildings have been made possible by the generosity of the Commonwealth, the City, Mr. Frederick Fanning Ayer and the heirs of the late Richard Kitson. Look about and behold the vast amount of work accomplished in so short a time. Think of the hours of careful thought and planning devoted by men already burdened by the management of some of the largest business affairs of our Commonwealth. All honor to them ! It is my earnest hope that they will be rewarded by seeing a splendid success for this institution, ---that this school may become the best, as it is already the largest in the world. Again I welcome you and trust that this occasion, memorable for its importance and the presence of distinguished men, may be one of benefit and pleasure to all.

The Chairman : “ The Commonwealth of Massachusetts has always believed in the education of her citizens. Sixteen years after the Pilgrims landed, the General Court founded, what was two years later named, Harvard College, where were taught the humanities. As time went on, instruction in another branch of education became necessary. She again joined the educational forces of the community, and as a result there was founded, for special instruction in the arts and sciences, the Massachusetts Institute of Technology, whose distinguished president is with us today. Once more the times changed, and a demand sprang up for training for the textile industries, which are today the chief source of our prosperity and wealth. Again the Commonwealth came forward, and as a result, certain legislation was passed, authorizing the establishment of textile schools, and the first to be established under this legislation was the Lowell Textile School.

“ In these institutions which have been built up by the bounty of the State, she has specified that she shall have a certain representation on the various boards of trustees, in order that her interests may be safe-guarded. I have the great honor to be one of the trustees of this school on the part of the Commonwealth, and my



colleague, Mr. Covell, joins me in publicly expressing the conviction that every dollar appropriated by the Commonwealth has been most carefully spent and full value received. What you have seen today is perhaps the best evidence of that fact.

“When the school was formally opened on January 30, 1897, we were honored by the presence of the late Governor Wolcott, who was one of our firm friends, and who thus publicly showed his personal interest and that of the Commonwealth. Today we are again honored in the same way, and it is my great pleasure to introduce—His Excellency, John L. Bates, Governor of the Commonwealth.

*Response of His Excellency, Governor John L. Bates :*

“The word Massachusetts is always suggestive of education. The State however, has never considered education as an end in itself, but only as a means of developing body, mind and character, as a means of bettering the conditions of men and their environment. Hence, it is not surprising to find that she has devoted much of thought, of energy, and of money to what may be called practical education, such as provided by her two great technical institutions of the highest class, the Massachusetts Institute of Technology at Boston, and the Polytechnic Institute at Worcester ; such as is further implicated by the recognition in her public school system of the importance of manual training ; such as is recognized in the instruction provided in the State Normal Art school in the principles of design, and such as is particularly shown by the establishment of the three young, but growing institutions, great in their possibilities, the textile school of Lowell, Fall River and New Bedford. These schools have been established as the result of the wisdom of those who recognized the importance of the textile industries of Massachusetts and the necessity for their further and higher development if she is to continue to rely upon them in large part for her business prosperity.

“The census of 1900 showed that what had been a fact for many years was still true, namely, that the textile industries were the most important of any in the State, for we have 512 textile establishments, giving employment to nearly one-third of our wage-

earners. There is invested in these establishments \$274,000,000 ; the value of their product is \$214,000,000, from which there is paid \$54,000,000 per year to 150,000 employees.

“ In the value and variety of these manufactures we easily rank first among the States of the Union, and not only first in textiles as a whole, but we are first also in the manufacture of cotton, as indeed we have been from the beginning of this industry ; first in the manufacture of worsteds, and first in the manufacture of woolen goods. Forty-one per cent. of all the spindles, and 39 8-10 per cent. of all the looms that join in the industrial chorus of the cotton manufactures of the land, are in Massachusetts ; 31 per cent. of all the spindles, and thirty-six per cent. of all the looms engaged in worsted manufacture are ours, and twenty-six per cent. of all the woolen goods made in the United States are made within our borders. Here was built the first cotton mill, and here the first woolen mill, and here was the worsted industry first developed.

“ But our leadership was threatened. “ The State was industrially great. The wealth and happiness of our people had come largely as the result of these various industries. The superior quality of our goods, and the advanced conditions under which our workmen labored, were known to all the world. In the course of years, however, the inventions and the skill which had made us so prosperous, had become the property of the world. Our competitors were becoming aggressive. The great South, rich in iron, in coal, and in cotton, was awakening from her long slumber. She not only had the natural resources I have enumerated, but she had that which was more important to her as a competitor of New England, she had cheap labor that could be employed without restrictions. And thus handicapped by reason of our distance from cotton fields and from coal and iron mines, and by reason of the conditions which the enlightened labor laws of the State rendered necessary in the employment of men and women, there was danger that Massachusetts would lose her leadership unless as in the past she set herself resolutely to the solution of the problem thus presented to her. Her labor was educated labor. It must be employed in such service as the uneducated labor of the South could not render.

“ Lowell gave to Massachusetts as governor, a man of rare qualities of head and heart. Adopted son from across the sea, he became the embodiment of American ideas,—the example of what was possible of achievement under American conditions. In the year that this textile school was provided for by an act of the Legislature, Frederic T. Greenhalge as a representative of the Commonwealth, was at the exposition at Atlanta in the midst of the rising cotton mills of the South. He went bearing a message of good will and of brotherly love, and he spoke of the friendly rivalry in textile manufacture and with prophetic vision he hopefully declared to the people of the South, ‘if you catch up with us in one line of industry, we must try to increase our pace. If we cannot do that, we will strike out in another line. If you must manufacture cotton cloth, we will dye it, and print it, and decorate it. If you make our product more cheaply than we can, we will diversify,—invent more delicate textures, more artistic designs.’

“ Such was the courage of the Commonwealth and her business men. As one means to this end the act of 1895 provided for the establishment of textile schools under certain conditions, and on Jan. 30, 1897, Governor Wolcott came here and formally opened this school.

“ We were not pioneers in this work. Many of the nations of Europe had preceded us in it, but none have pursued it with greater energy, or on a more comprehensive plan, for here we have an institution that has a more varied equipment than any other in the world. That it meets a want and satisfies a need, is shown by its more than 500 pupils taking the regular courses of from one to three years, and even longer. Here are taught practical things—chemistry, decorative art, mechanics. These schools are the product of the public spirited generosity of the citizen and of the business-like liberal provision of the Commonwealth. New Bedford and Fall River are following in the steps of Lowell, and are building up most worthy institutions of this character. In all, the Commonwealth has expended since 1895 as her contribution toward the buildings and for running expenses of these three schools, \$350,000, of which amount \$203,750 has been expended on this school.

"Today, as a representative of the Commonwealth, I am permitted to see and to realize something of the broad foundations on which the trustees have built. I see nothing except that which should call for the expression of my most sincere congratulations to all concerned in this work, for in these buildings, in this school, I see the promise of the higher training of men and women, the promise of the development of greater skill, the promise of finer grades of goods, the promise of more elaborate fabrics, the promise of the continued leadership of the Commonwealth in the textile manufactures, the promise of her continued and increasing prosperity and the promise of the complete industrial independence of America."

The Chairman : "The Lowell Textile School has been most fortunate in the men who have served on the Board of Trustees. They have given liberally of their time and experience, and have always had an abiding faith in its value and success. The foundations were laid on broad lines for future development, when many were sceptical, but the present success has already justified the wisdom of the original plans adopted. The school has grown faster than our most sanguine expectations, and we cannot fill the demands made for our graduates. We feel, however, that we have but already begun, and count on the hearty support of all to carry forward this great work, the importance of which is just beginning to be realized.

Most active and untiring in everything relating to the school has been the President of the Board of Trustees, whom I now introduce, Mr. A. G. Cumnock.

*Pres. A. G. Cumnock's Address.*

#### THE TEXTILE INDUSTRY AND ITS NEEDS.

"The occasion which has drawn us together this afternoon marks an era in our national business world, the importance and far-reaching effect of which no one here can estimate, or foresee.

"It is fitting at this time, when every eye is turned to questions of economics in this country, which has made such stupendous progress in the last few years, to consider one of its most important industries, — the manufacture of textiles.

“Let us turn for a moment and see what the city of Lowell has meant in the industrial history of the United States.

“In 1792 —Dudley A. Ting, William Coombs, and others, were incorporated as the Proprietors of the Locks and Canals on the Merrimack river.

“At Waltham in 1813 some merchants of Boston built a mill, complete in itself so far as having all the operations of picking, carding, spinning and weaving were concerned, and one that was successful in its operations.

“Encouraged by their success at Waltham, but having exhausted the water power on the Charles river, they turned their attention to the Merrimack.

“Three men, — Francis C. Lowell, Nathan Appleton, and Patrick Jackson came to East Chelmsford, now the City of Lowell, and examined the water power of the river, made a purchase of the same, and later laid out canals and other arteries to carry the water to the water wheels.

“These men had faith in the future—and they laid the foundation of a great textile city, with the largest aggregation of textile mills in any one location in the United States ; and it is justly called the ‘ Mother Textile City of America.’

“Coarse sheetings, shirtings, drills and prints were manufactured for many years at a great profit—but as time went on, competition sprang up, and with it the call for finer fabrics and a higher grade of skilled workmen.

“In order to avoid the keen competition in coarser fabrics we were obliged to turn our attention more and more to fine goods with difficult weaves, and delicate colorings.

“We import annually nearly ninety million dollars (\$90,000,000) worth of high class fabrics.

“England, France and Germany have for many years fostered textile schools, endowed them with great gifts,—and herein lies the secret of their large importations into this country.

“These facts have been looked upon with ever increasing interest by a few far-sighted men, with the result that textile education was deemed necessary if we are to combat this influx of high grade fabrics from foreign markets.



"The Lowell Textile School was incorporated June 18th, 1895,—the incorporators being :

"Augustus Lowell, A. G. Cumnock, Edward W. Thomas, Charles L. Hildreth, William S. Southworth, Eugene S. Hylan, A. G. Pollard, Jacob Rogers, Frederic S. Clark, Alvin S. Lyon, Frederick Lawton, Edward W. Atkinson, Thomas Walsh, Haven C. Perham and James T. Smith.

"Subsequently, and prior to the opening of the school, Walter E. Parker, Franklin W. Hobbs, Frederick E. Clarke, Edward D. Holden, and J. W. C. Pickering were elected additional permanent trustees.

"Under the terms of the act, Hon. William F. Courtney, mayor, and A. K. Whitcomb, superintendent of schools of Lowell, became trustees ex-officio, —and Augustus Lowell and Howard Stockton were appointed trustees by Gov. Wolcott on the part of the Commonwealth.

"At the organization, A. G. Cumnock was elected president ; James T. Smith, clerk, and A. G. Pollard, treasurer.

"After all the legal difficulties had been overcome a meeting was held June 19, 1896 ; the necessary committees were appointed and Jan. 30, 1897, the school was formally opened in the Parker block, Middle street.

"Here we occupied 10,000 square feet of floor space ; the growth from year to year was so great that when we moved to this permanent home we had covered 30,000 square feet.

"Our success has been phenomenal ; after five years almost to a day we are in permanent quarters.

Mr. Cumnock here gave a description of the building and then named the generous gifts which made them possible. Continuing, he said :

"We need additional room for a French worsted plant, and also an extension of our weaving department.

"Plans have been made by Messrs. Lockwood, Greene & Co. the engineers of the entire plant, for a head house to be erected at the corner of Falmouth street and Colonial avenue,—three stories and a basement, 70 by 80 feet.



“We have in land nearly ten acres, — 6  $\frac{3}{10}$  the gift of Mr. Frederick Fanning Ayer of New York City, and 3  $\frac{6}{10}$  acres the gift of the proprietors of the Locks and Canals—valued at \$100,000.

“We have buildings, already mentioned, \$225,000, and in equipment, \$110,000, the joint gifts of the Lowell Machine Shop, Davis & Furber Machine Co., North Andover; Kitson Machine Co., Lowell; Crompton & Knowles Loom Works, Worcester, and a great many others that I have not the time to mention by name, making a total of \$425,000. Of this sum the Commonwealth has given \$91,750, besides annual grants of from \$15,000 to \$20,000 for maintenance.

“After such a record as this, in only five years, I have no apology to make. We have proved our right to exist. From 69 pupils at the start, — we now register 545. *etc.*

“Massachusetts has capital invested in textile industries to the amount of \$283,500,000, and the yearly value of textile industries is \$225,100,000. This last amount is nearly twenty-five per cent. of the output of all the industries of the entire Commonwealth.

“With no raw material produced in our State, with the possible exception of a trifling amount of wool, and with coal brought from a distance—Massachusetts has only labor, and if she is to hold her old-time place, and keep her capital at home, she must indeed foster such institutions as this.

“So, gentlemen, I appeal to you and through you to the State and to our city, for your moral and financial support, that our school may be a great power in producing skilled workmen, who will solve the problem of changing conditions we now face—and reverse the order of things so that instead of being alarmed about our capital leaving the State, we shall find outside capital coming in.

“Our doors are open to all; we welcome the man or woman from the university, college, or public school; the man or woman from the card or the loom have the same opportunity to get thorough instruction covering the field of textile manufacture, from the raw material to the finished fabric, embracing all commercial fibres.

“Emerson says that our best friend is the man who makes us do our best—all we ask is the chance.”

The Chairman : " The Massachusetts Institute of Technology has a world-wide reputation, and it is hard to realize that it was founded less than forty years ago. The great progress it has made in so short a time, and the high standard it has set, have been due, in a large measure, to the men who, beginning with the late Wm. B. Rogers, have been at its head. The present chief executive came to it with a national reputation, acquired in the service of the government, and under his administration not only have the high ideals of the past been maintained, but already great advances have been made, and plans for still greater usefulness and higher service are under consideration. He has always been interested in this school, and is one of its trustees.

" I have the honor to present Dr. Henry S. Pritchett, the president of the Massachusetts Institute of Technology.

*Dr. Henry S. Pritchett :*

*M. A. T. N.*

#### NEW ENGLAND'S LEADERSHIP IN THE TWENTIETH CENTURY.

Trustee Henry S. Pritchett, LL. D., President of the Massachusetts Institute of Technology, said in opening, that he thought there were some points upon which " Tech " might envy the Lowell school. " I wish that we might look out, from the institute, upon so fair a scene, and so splendid an expanse of light as you have here." He continued as follows :

" The world has just begun a new century, as civilized man counts time, and we have marked it, as we are prone to mark important turning places, by reviews of the past and by attempts to forecast the future. Such experiences are not without their value. It is a good thing, now and then, to pause long enough to take account of stock, both in material and in spiritual matters. Such examinations serve to clear the way for new action.

" When the new century was ushered in 100 years ago, New England's position in the Union was a commanding one. Twenty-three per cent. of the entire population dwelt within her borders. A New England President had just occupied the President's chair. Jefferson, at the beginning of his administration in 1801, had in his cabinet of five, three members from Massachusetts. In wealth and industrial power in intellectual alertness and commercial enterprise the promise of leadership was foreshadowed.

“ And this promise blossomed into a noble fruitage within the first half of the century. A long line of famous men made Boston and New England known the world over. The development of manufacture advanced by leaps and bounds, and a world commerce was built up which made New England ports and New England ships familiar names in every sea.

“ As we stand at the beginning of another century it is evident that the last 50 years have brought a remarkable readjustment of political, industrial and commercial interests. New England begins the new century with less than eight per cent. of the population of the Union within her boundaries.

“ The centre of gravity, both of intellectual and material things, has moved steadily westward. The centre of agricultural activity 50 years ago was in West Virginia, while today it is somewhere in Illinois ; the centre of population 50 years ago was near Parkersburg, while in 1900 it was to be found near Mansfield, O. ; the centre of manufacture 50 years ago lay near Altoona, Penn., while it also today lies near Mansfield, O. The westward drift of educational activity is even more marked.

“ As one looks back over the part which New England played in the settlement and development of our nation, as one thinks of the movements which have been led and carried to successful issue by New England men in the first half of the 19th century, when one calls to mind the glories of her commercial expansion in the days before the Civil war, the question naturally comes to mind — what role is New England to play in our national life in the century upon which we are just entering ?

“ Will she be satisfied with anything less than leadership, and if not, in what direction may she fairly expect to exercise such leadership ?

“ I have heard, once and again, a pessimistic note in which it is intimated that New England is ready to rest upon past glories, that for the future she will be content to serve as the conscience of the nation ; that her chief contributions will consist in furnishing education to the rest of the country, and the facilities of a good summer climate to the inhabitants of the Mississippi valley.

“ I must confess that this sort of talk seems to me utterly unworthy of the New England spirit and the New England traditions. I hope that New England may remain, as she is today, pre-eminent in educational facilities; that she may attract in ever-growing numbers students and visitors; leadership in education, however, cannot remain permanently in the hands of a region whose activities are purely academic.

“ If New England is to lead in education she must also lead in the material enterprises and the political interests of the nation; and there never was a time in the history of our country when her opportunities for such leadership were better.

“ There was never a period, either in the days of revolutionary agitation or in the busiest epoch of her mercantile development, when there lay before her a fairer road to leadership than that which the 20th century points out.

“ And perhaps at the inauguration of such a building as this—an enterprise having to do at once with education and with industry—we can spend a half hour in no more profitable way than to consider in what directions national leadership lies, and in which of these New England may hope to gain distinction.

“ ‘ There be three things,’ wrote Bacon, ‘ which make a nation great—a prosperous and fertile soil, busy workshops, and easy conveyance for man and goods from place to place.’ The judgment of mankind since Bacon’s day has practically accepted this judgment, with certain modifications which the history of the last one hundred years has brought in.

“ The fertile soil, if that be held to include the treasures of the mines, the busy work-shop, and effective transportation are the material bases of wealth and prosperity. We know now that back of these lies the power of education and of training, and these may be reckoned among the great assets of a nation.

“ To the first of these endowments for a national prosperity New England can make no claim. She may frankly admit that agricultural leadership must go to the rich valley of the central west, and that however much her agricultural products may be improved by intelligent cultivation they cannot compete with those of the more favored region.

“ But in the other directions along which greatness is to be sought, in intellectual leadership, in industrial leadership, in commercial leadership, there remains for New England a fair field, and in these she has not only an equal chance with other sections of the country, but certain distinct advantages.

“ First, as to intellectual and political leadership. If education counts for anything New England has a distinct advantage over most sections of the country. Her schools, colleges and universities have had the advantage of a larger growth, of more careful study by educated men, and of more generous support than those of any other section.

“ An educated population has in this day an enormous material advantage over one not well educated. Particularly is this true of a manufacturing region where readjustments of the industrial system must from time to time be made. The well-educated business community can make such readjustments with greater quickness and with far less friction than the same readjustments would require in a community not so well educated. In this sense New England has a distinct commercial asset of great value in its schools and colleges.

“ But does intellectual and political leadership go with superior educational facilities?

“ Intellectual and political leadership—they ought to go together and they generally do—are not the product of intellectual alertness alone. The ability to think is a necessary factor, but not the only one. Political leadership is the outcome of effective citizenship, and citizenship to be effective must include not only the intellectual quality, but also a sympathetic understanding of men, the ability to comprehend the view point of other men and of other parties. No man, no association of men, and no geographic section can hope to lead in national affairs by intellectual keenness alone.

“ There has been a deal of talk concerning the fact that this country has of late years got into the habit of choosing its presidents from Ohio, and one hears a certain amount of ridicule cast upon what is called the ‘Ohio type.’ I am not here to defend the



Ohio man. He probably needs no defender — he certainly needs no assistance in getting office; but I am inclined to think that there is something more than the pressure of political exigency to be seen in the continued choice of men from the region of Ohio for high public office.

“Ohio and its section lie in the great highway between the east and the west, between the north and the south. It reaches up to the great lakes on its northern boundry and touches hands with the south on the Kentucky shore. Settled in large measure by men from New England and Virginia, its sons retain the traditions of their ancestors. Yet with the instinctive vision of the pioneer, they reach out kindly hands to people of other sections and of other faiths.

“It is a far cry from the New England manufacturer to the man who is cultivating olives back of San Diego; there is little in common between the man growing cotton in Georgia and the men mining or cutting lumber in Washington; but Ohio is in the midst of all of it.

“To go anywhither one must go through Ohio, unless he puts out to sea. As a result there has been developed in this section a type of man, of whom President McKinley was the supreme example, who comes nearer than any other American thus far developed to understanding our manifold interests; one who is in closer touch with the diverse problems of our American politics. And this ability to understand is a source of power and of leadership.

“It is a frequent commentary upon our methods of political education that the most insignificant geographic divisions are often allowed to isolate a people from those akin to them in blood and in social history. A small mountain range, a narrow sea or an imaginary boundary line has more than once sufficed to bring about political isolation.

“In 1845 Mr. Gladstone, then just beginning his long career in public life, wrote thus to a friend: ‘Ireland is likely to find this country in Parliament so much employment for years to come that I feel rather oppressively an obligation to try and see with my own eyes instead of using those of other people, according to the limited



measure of my means. I am desirous to know whether you are at all inclined to entertain the idea of devoting the month of September to a walking tour in Ireland with me for the purpose of looking from close quarters at the institutions for the religion and education of the country and at the character of the people.'

"This plan seemed a wise one for a rising young statesman, but, curiously enough, the trip was never made. I do not know whether Mr. Gladstone's experience in this respect was a unique one among English statesmen, but it would be quite in accordance with the usual order of things if most of those who have dealt with the Irish question for the past 100 years have chosen to do so without troubling themselves to make the short journey across the Irish channel and study the conditions at first hand.

"Perhaps after a while our country will grow so large, its interests will become so complex, that we will require our statesmen to take a four years' course of preparation in interstate and international studies, as we now expect our professional men to do; and particularly might this be done in the cases of those whose tenure of office is for life, as is practically the case with members of the U. S. senate.

"Under such a plan a senator-elect from a New England state might spend a year in the South, learning not by a hurried trip, but by actual residence, the economic and political questions which confront that section; he could pass another year in the central and western states, and a third in making the acquaintance of Canada and Mexico and our South American and West Indian neighbors.

"And the last year might be given to a visit to the Asia coast, the Phillipines and Europe, including Russia. The southern and western senator would begin his course by spending a year in New England.

"The plan sounds very academic and impractical, but it is difficult to see how such a preparation would do any harm to a man who was about to begin a service of many years in the U. S. senate. Perhaps it might have a tendency to make his view of public matters less local, and even to put questions like that of the tariff in the list of general economic problems rather than to leave it a matter of local and individual barter.

“ New England has had three presidents in the 112 years which have elapsed since Washington's first inauguration. Each of these served one term of office. Men of our generation may well hope to greet another New England president, and may well aspire to make New England a strong factor in determining the policy of our government, but this will come about in just such measure as our citizenship is one of the whole country and not of one section.

“ The probability of our public men being chosen for the great office of president of the United States will increase in just such measure as they deal with the national problems from the view point of the whole country and the whole nation rather than from local and temporary considerations, and the total influence of our people upon intellectual and political relations will grow in just such measure as we keep in close contact with our countrymen in the South and West—and, for my part, I should like to include in this, our neighbors of the North and the East, for in this day a nation does not live to itself any more than does the individual.

“ As one reviews the work of the past 100 years in New England, there is no part of it to which we can point with greater pride than to the growth of industry and manufacture. In Hamilton's paper, now become a classic, ‘ A Report on Manufactures,’ submitted to Congress in 1791, he enumerates some 17 industries ‘ which have grown up and flourished with a rapidity which surprises us and which furnishes the assurance of future attempts.’

“ With the growing market west of us, the enterprising men of New England threw themselves heartily, at the beginning of the last century, into the development of manufactures. The enormous growth of our industrial plants, the facility with which they have met competition, the success with which they have undertaken readjustments of trade, have been alike creditable to New England's energy and to New England's quality of administration.

“ There needs only to be continued similar energy and courage, coupled with the best modern training, to maintain our industrial leadership, and to extend it. And in this effort, which

lies at the very heart of New England's prosperity, the significance of such a school as that in which we meet today can scarcely be overestimated.

"Industrial progress, industrial success and industrial leadership can be secured and held only when it rests upon the sure foundation of industrial education ; for education and training have come to mean in our day something other than academic knowledge.

"They mean the training of all the powers of the man, that they may be brought to bear efficiently upon the problems before him, and if a nation is to equip itself for every side of intellectual and industrial endeavor, the education and training of its students must be provided for, not in one direction alone, but in many.

"It is only a part of the education and of the training which a nation demands when the minister has been fitted for his pulpit, when the lawyer has been made ready for the bar, when the scholar has been sent into the field of research. All these are necessary, are noble, are splendid ; but they reach, after all, only a small minority of humanity, excepting by those indirect influences which permeate society.

"They do not deal with the direct problems by whose solution each individual citizen is to be made an effective unit in the dynamic economy of the nation. In order to do this, in order that a nation may be made up of men who reach maximum efficiency, education and training must reach down to each individual citizen, whatever his calling.

"This is the day of the trained man, and it is the purpose of such a school as this to send out men trained in the textile arts. There is no other form of education to which the State may lend its aid which will in the end bring so large a return as technical education, not only in increased wealth, but also in increased moral power ; for efficient training brings not only increased power of thought, but increased moral power as well.

"The efficiently trained man, whether he be engineer, or architect, or foreman, or skilled laborer, is a strong moral factor as well as a strong economic factor in the work of a nation ; and as we stand here today to dedicate to the uses of the Lowell Textile

School, buildings which are the joint gift of the Commonwealth and of individual public spirit, we may well say that such an effort and the development of such a centre of training is a most effective step which New England can take toward that industrial leadership for which it aspires, and which can come only through organized training.

“Commerce, which Lord Bacon links with industry, and should go hand in hand with it, is another field of national greatness in which New England may well expect to lead. A manufacturing community needs, in the very nature of things, to interest itself in commerce as well.

“In our day this need is accentuated by the fact that the raw products are coming to form a constantly increasing part of the cost of manufacture.

“New England, and Massachusetts in particular, must develop the problems of commerce and of transportation side by side with that of manufacture, if it looks for supremacy in either.

“And the problem of transportation concerns itself no less with transportation by land than by sea. If we ever expect our Boston ships to go, as they once did, to all parts of the world, we must develop at the same time between Boston and the interior, ample and efficient lines of transportation, lines that are not alone able to care for the traffic, but which are devoted to our interests as well.

“There was a time in the past when the merchant fleets of Boston sailed in all seas and traded in all ports; and there was a time, not many years ago, when a number of the most important railroad lines of the interior were owned in Boston.

“The Civil war swept out of existence the merchant marine, and the railroads have been sold to men in New York. Our very education seems to have been away from commerce. If we are to make in the 20th century a new effort for a role in foreign and domestic commerce, it will be necessary to study the whole problem afresh.

" It is true we are gaining in the commerce of our port, but our foreign trade as compared with New York is still very small. Last year, of the whole foreign trade of the country, New York had about 45 per cent. and Boston little more than eight per cent., exceeding by only a small amount that of New Orleans. If we are to strive for the prize of the world's commerce two things seem to me necessary:

" First, the whole problem of transportation of the sea and of the interior must be taken up as a single problem. Second, we must do it ourselves. I have no question that the citizens of Massachusetts would have been gainers many times over had they begun 20 years ago and dredged their harbors themselves, instead of waiting the slow, if generous, policy of the United States government.

" A splendid appropriation has been made by Congress for this work, and in time we are to have a channel into Boston 35 feet deep. At the same time our generous government is expending a similar appropriation in dredging a channel into New York harbor 40 feet deep, and I have an idea that as long as we leave it to the government the New York channel will be about five feet deeper than ours.

" Natural facilities unquestionably count in the development of a great harbor, but the business of a port depends in larger measure than ever before upon the enterprise and farsightedness of its citizens. Venice, whose commercial history is perhaps the most wonderful in the world, developed its shipping under conditions singularly unpropitious. By her energy and genius for commerce she sent her fleets to distant shores, controlled the destinies of empires and acquired a naval power which is unique in history.

" We have on our coast an example of the fact that great natural facilities do not alone make a great port. As one glances at the eastern shore line of the United States, the capes of the Delaware and of the Chesapeake at once catch the eye as entrances to great interior waterways. Chesapeake bay, the lower of these two is one of the most remarkable bodies of water in the world, and



into it, from the west, flow a series of splendid streams. Almost opposite the entrance to the capes lies a great estuary of the bay, forming the mouth of the York river.

“ On its shore lies old Yorktown, and here in 1781 came the fleets of De Grasse to help Washington force the surrender of Cornwallis. It is one of the finest natural ports in the world—a great basin from 6 to 10 fathoms deep, and sheltered on all sides. Any vessel that can enter the capes of the Chesapeake may cast anchor there.

“ Back of it lie the great coal fields of West Virginia, and by direct route the grain fields of the West. To almost any other country such a harbor would be a priceless possession. Today, York river is almost unused. A great commerce passes day by day and month by month past its very mouth, traverses the whole length of the Chesapeake, and is dragged up a narrow channel to Baltimore, but not an ocean-going vessel enters York river basin. In a word, natural facilities form only one factor in the commercial development of a port. And the commerce of our harbors will depend, and increasingly so, upon the foresight, the administrative faculty, and the enterprise of our citizens.

“ Through all the great enterprises of commerce on the sea there has run a thread of adventure. It was a fitting title which the old commercial companies chartered by Henry IV were given when they were called ‘merchant adventurers.’ Their enterprises among the colonies of North America and along the Spanish main appealed not only to their commercial genius, but to their spirit of adventure as well. And it is of the essence of world commerce that it should keep alive with this old-time spirit.

“ The merchants of Hamburg, in the splendid commerce which they have developed in the last 20 years, have shown that they still retain this old-time spirit of adventure. Today German commercial expeditions, generally called exploring parties, are penetrating all the remote corners of the earth—New Guinea, Africa, the Hinterland of the Amazon.

“ These are not sent by the government, but are fitted out and maintained by the great commercial houses of the Hansel cities, and are evidence of the survival of the spirit which made the old



Hanseatic league so great a power; they are reminders of the days when the merchants of the league banded together against piracy, and when they enforced their supremacy even in the ports of England. They were 'merchant adventurers' then, and they are 'merchant adventurers' today.

"No other prize of wealth is so dazzling in magnitude and in richness as that which the world's commerce holds out. In comparison with it the gold of Ophir and the diamonds of Golconda lose their lustre; but that state which aspires for a share in it must be ready to say with Romeo: 'I would adventure for such merchandise.'

"Perhaps it is in part due to this thread of adventure and romance which runs through the world-traffic that literature and art have ever followed close to the path of such commerce. The golden days of Venice came with her commercial supremacy, and the literary epoch of New England, the age which gave birth to Lowell, Longfellow, Holmes and Emerson, was that in which we covered the seas of the earth with our sails.

"As men of New England looking down the vista of a new country, let us estimate at a true perspective its value and its opportunities; let us gird ourselves for a share in the leadership of the nation and of the world.

"Let us look forward and not backward — toward the rising not toward the setting of the sun — so that, when the men of New England foregather at the dawn of the 21st century to estimate the fruits of the century behind them, they may rejoice that there still remains in the old home of the Puritans a full share of leadership — a leadership in intellectual and political progress, and in commercial and industrial progress as well."

The Chairman: "The support of the leaders of the textile industries is essential to secure the best results in the work of this school. The school aims to help the manufacturers and expects in return their coöperation. In order that this interest may be strengthened, we have invited representatives of the manufacturers of wool and cotton to speak today, and I take great pleasure in presenting Mr. William Whitman, chairman of the executive committee of the National Association of Wool Manufacturers.

*Mr. William Whitman's Address : Section and page  
to page 29*

MASSACHUSETTS SAVINGS BANKS AND CORPORATE MANUFACTURING SHARES.

“ Mr. Chairman, Ladies and Gentlemen, Citizens of Lowell : It affords me great pleasure, in behalf of the wool manufacturers, to unite with the trustees of this school, the representatives of other industries, and your distinguished guests in the dedication of these new buildings. The wool manufacturers of Massachusetts have for a long time realized the great need of technical education to advance their industry and to give it a character distinctively American. My public advocacy of textile training began as long ago as 1878, in an address delivered at a banquet given to the National Association of Wool Manufacturers by the wool merchants and the wool manufacturers of Philadelphia. At that time it did not appear possible that state and city support could be secured for founding and maintaining textile schools. Happily a great change has taken place in public sentiment in this regard. The results of the six years' work of the Lowell Textile School, the first of its kind to be established in this Commonwealth, have been so satisfactory as to warrant our congratulations alike to the Commonwealth and the City of Lowell for their support and encouragement, to private benefactors for their generous donations, to the trustees to whom the school is so much indebted, and to the officials and teachers whose educational work has brought to the institution so large a number of students.

“One cannot but be impressed with this splendid location, with the magnitude of the buildings, their simplicity and beauty of design, and their adaptation to the uses to which they are put. There seems to be a peculiar fitness in the selection of this site in the city of Lowell for the first textile school established in the Commonwealth. It was in this city, of which we have so commanding a view from these grounds, that the modern system of textile manufacture was first established on a large scale in this country by Francis C. Lowell, Patrick T. Jackson, and their associates. It was here that the first attempt was made to utilize the

water power of the Merrimack river in developing textile industries. The men whose names are identified in establishing these enterprises possessed what now seems like prophetic insight into the industrial possibilities which lay hidden in the bosom of that river; men whose achievements impart a lustre to Massachusetts not surpassed by her statesmen, her scholars, or her poets — men with the brains to understand what wealth this river could be made to create, what noble cities might spring from its banks, what thousands of people might here earn their livelihood — men with the courage, the energy, and the skill to convert rivers into mill powers, and meadows into teeming cities.

“Massachusetts occupies an anomalous position as a great manufacturing center. She is dependent upon distant states for all her fuel both for domestic and manufacturing purposes. A very large proportion of her food supply is drawn from without her borders, and she imports all her raw materials for manufacture. Notwithstanding these natural disadvantages, Massachusetts is one of the most prosperous communities in the world. This is due to the enterprise, sagacity, honesty, thrift, and industry of her citizens.

“The fishing industry of which the historic codfish in our legislative hall is an emblem, ship building, shipping, foreign commerce, and railway developments have all been sources of wealth; but the source of chief prosperity for more than half a century has been the textile industries. Our rivers and streams were the original basis upon which they were founded. These water powers have long since been outgrown. The industries have changed in many of their characteristics and have become fairly established in other states. Predictions of decadence have reached us from authoritative sources; but my faith in the future prosperity of these industries in our beloved Commonwealth remains as strong as ever. We shall continue the textile industries and we expect the graduates of our technical schools to be prime factors in successfully carrying them on.

“From the earliest times the national policy has fostered our manufacturing industries, and especially during the past forty years, which period marks their greatest development. The Commonwealth has only recently lent a helping hand, and there is much

yet for her to do. Legislation for the common good should not be stinted. I am so deeply impressed that our industrial development has been retarded in one respect by unwise legislation, that I propose to take advantage of this opportunity to direct your attention to it and suggest a remedy.

"The manufacturing industries of Massachusetts give direct employment to 497,000 workers, or more than one-sixth of the entire population. This is exclusive of clerks, managers, salesmen, and other officials, and is also exclusive of all persons employed in other industries, trades, and professions that are indirectly but closely allied with and largely dependent upon them. The capital invested in these industries is more than \$823,000,000. The value of the annual product is \$1,035,000,000 and the annual payment of wages is \$228,000,000. They furnish direct employment to 153,000 work people with an annual pay roll of \$55,000,000 and an annual product valued at \$225,000,000, equivalent to 24.2 per cent. of all manufacturing industries.

"The amount deposited in the savings banks of Massachusetts is \$583,000,000, which represents accumulated savings of labor. The figures I have quoted show the relations of the savings banks, manufacturing industries, and textile industries of our Commonwealth to and with each other. Notwithstanding the enormous amount of capital invested in manufacturing industries with its very profitable returns and the large proportion of our people employed therein, such investments are not regarded by capital with the favor to which I believed they are entitled. (From personal observation and experience, as well as from information gathered from many sources, I am satisfied that the greatest bar to the free investment of capital in industrial corporations is caused by the lack of a broad and certain market for their shares. It seems to me that this restricted market is largely due to the savings banks' laws of the Commonwealth which discriminate against industrial corporate investments. These laws prohibit savings banks from investing in the shares of such corporations although they are within the borders of the Commonwealth, established under and controlled by her laws. Nor can savings banks legally make loans to individual citizens offering such shares as collateral security. Dependent as is the Commonwealth for her prosperity upon these industrial enterprises

within her borders and much as they have contributed to her wealth, dependent as is also the employment, happiness and comfort of her citizens she says to the custodians of the savings of these industrial workers. You must invest such savings in certain notes, mortgages, state and city bonds, certain railroad bonds and stocks, trust companies and bank stocks, but you cannot invest any of these savings in the industrial enterprises which give employment to so large a number of your depositors, and which are the source of their savings and upon the successful prosecution of which such savings depend. She also says to such custodians: You may loan the savings of these textile workers to bankers, brokers, speculators and others upon certain securities, whether located within or without the Commonwealth, but you cannot loan any of these savings upon the securities of any manufacturing corporations incorporated under Massachusetts laws.

“This discrimination by the Commonwealth against the shares of her manufacturing corporations can only be construed as an expression of want of confidence in the security and earnings of investments. This coming from so high an authority depresses the value of such investments among all investors and consequently restricts the market for manufacturing shares. Such shares lack the seal of the Commonwealth. Stamp such shares with the Commonwealth’s approval instead of her implied condemnation. This will inspire confidence throughout the whole community, create a wider market and secure more reliable corporate accountability.

“The deposits in the Lowell savings banks amount to \$24,000,000 while the capital stock of all the textile corporations in the city is less than one-half of this sum. Yet the savings banks in this city whose deposits come so largely from the earnings of the operatives of the mills cannot legally invest any of their savings in the stock of these corporations. The city of Lowell whose creation was the result of the establishment of textile industry and whose prosperity depends almost entirely upon the success of the corporations now engaged in that industry is discriminated against by the fact that none of the savings of her citizens can be invested in their own industries. While the laws governing corporations in the Commonwealth of Massachusetts have for the most part been wise,



and the utmost care should be taken before introducing changes in these laws which alike protect corporations, their stockholders and the public at large and while I am decidedly opposed to the corporation laws of many other states, it seems to me that such legislation should be adopted as will enable the industrial workers of this Commonwealth to have a reasonable and proper proportion of their earnings invested in the capital stock of our manufacturing industries, which can be done with perfect safety and great profit to the savings institutions and their depositors. The public welfare requires that the largest possible proportion of the capital and savings of her citizens should be invested in her Commonwealth and it is our duty to afford every possible opportunity for such safe and profitable investment. No one will question that the prosperity of the Commonwealth depends upon the largest possible steady and profitable employment of her people. With her environment I see no other way of securing this, but through manufacturing industries. If this be true, self interest and patriotism call upon us to use every means which God and nature may place in our hands to broaden and strengthen them."

The Chairman: "Lowell has always been noted for her manufactures of cotton; it was here that the modern factory system began, and from it have flowed, in a great measure, the prosperity and prestige of this city. On account of the increasing competition of the South, we feel that this school is to be of especial benefit to cotton manufacturers, and we are fortunate to have with us today the President of the New England Cotton Manufacturers Association, whom I now present, Mr. Charles H. Fish.

*Mr. Charles H. Fish :*

"We, the manufacturers begin to realize that as another link in our civilization, the textile school has become a necessity. The old rule of thumb methods, practiced with so much success for many years, have been forced into oblivion by the advance of progress. To be a successful manager today, one must start early, must understand his business himself, or have at least sufficient wisdom to know that he does not understand it, and employ those who do. The man who is practical only, still has his place. The



man who is theoretical only, also has a place in the great struggle for existence, but the area upon which either class stands is becoming more and more limited, and is so crowded that it offers but little inducement to the really ambitious youth. It is a proper, or effective, combination of the two that opens up the broad possibilities of the useful career.

“ I am greatly pleased to be able to take a slight part in these exercises, for I am a firm believer in the practical technical education. In my own experience, short perhaps compared with some, but in a way varied, I have met with many cases, especially in textile and mechanical lines, where practical ignorance rendered the otherwise bright and well educated theorist a dangerous man to tie up to or employ. It is the practical experience, verifying or correcting the teaching of theory, which really makes us masters of the situation. The theoretical knowledge reaches far beyond the practical, but the practical, like the tool in the hand of the sculptor, is the means without which we may not be able to show our skill.

“ The modern textile school, so perfect an example of which you have in this Lowell Textile School, gives to the students the very best facilities for absorbing the practical, with a correct and comprehensive study of the theoretical. Herein lies its value.

“ The same applies, in another line, to various trade schools and colleges or schools of Technology.

“ Representing the New England Cotton Manufacturers' Association, as its president, I welcome these splendid advancements in the line of textile education, and I am proud of my Association, as every member must be also, for the manifest interest it displayed and the material help it gave in the early days of the movement toward the textile education in America.

“ It is, I think, an undisputed fact that the New England Cotton Manufacturers' Association made the original suggestions, and did the initial work which resulted in the establishment of textile schools in Massachusetts. As a matter of interest, I would briefly call your attention to the transaction of the Association, and we find as follows :

"On April 21, 1869, (Vol. 6, P. 5) the following resolution by Mr. George L. Ward of Boston, treasurer of the Lewiston Mfg. Co., was offered and laid upon the table: Resolved, that this organization recommend that the agents of the several mills adopt some uniform plan whereby a larger number of operatives than heretofore may be taught the several branches of the cotton manufacture, and that provision for such teaching be hereafter incorporated in the regulation of every mill.

"On motion of Mr. Wheelock of Norton, the subject was referred to a committee of three, to be appointed by the chair, to consider the same and report thereon at a future meeting. The President, E. A. Straw, appointed Messrs. George L. Ward of Boston, Godfrey Wheelock of Norton, and William P. Haines of Boston, as this committee.

"At a meeting held April 20, 1870, (Vol. 8, P. 19) Messrs. Ward and Haines submitted a report, recommending that each manufacturer should adopt it as an essential part of his policy, to have constantly a number of hands in training, etc.

"On motion of Mr. Burke, it was voted that the report be accepted and the consideration thereof be deferred to the next meeting of the Association.

"On October 19, 1870, (transactions Vol. 9, P. 5) it was voted that the report be laid upon the table, although it was assigned for this meeting in the call, but a note states that through a misunderstanding the reporter was not present, and it was quite possible that consideration was given the subject at this time.

"At the meeting held on October 3, 1883, (Vol. 35) Mr. Edward Atkinson advocated the establishment of a textile library and museum, in connection with the Institute of Technology, Mr. Atkinson described the European textile schools and advocated the establishment of similar institutions in New England.

"On September 28, 1894, (Vol. 57, P. 140) Mr. E. W. Atkinson of Boston submitted to the Association a very valuable paper upon technical textile schools.

"On April 30, 1896, (Vol. 60, P. 187) Mr. Edw. W. France, director of the Philadelphia Textile School, submitted a paper upon technical education in the manufacture of textiles. In this paper Mr. France goes carefully into a discussion of the needs in New

England for the textile schools and refers at length to the textile schools of foreign countries.

“ Following this paper is one by Mr. Frank P. Bennett on public textile education in America. Mr. Bennett as a member of the Massachusetts legislature was perhaps responsible for the passage of the Act of 1895, which authorized, or legalized the organization of corporations for the purpose of establishing and maintaining textile schools under certain prescribed conditions.)

“ On September 22d and 24th, 1896 (Vol. 61) Mr. Christopher P. Brooks of Charlotte, N. C., spoke forcibly of the advantages of textile instruction, followed by Mr. William G. Nichols upon the same subject (page 189.)

“ And so we lead on through the transactions of the Association and on April 29, 1897 (Vol. 62 P. 170) we find an interesting description by Mr. Christopher P. Brooks of Lowell, Mass., of the Lowell Textile School.

“ In nearly all, if not quite every one of the transactions from the origin of the New England Cotton Manufacturers Association, up to the present date, can be found valuable papers and discussions on the subject of textile education. We cannot overlook the fact, however, that it is only through the beneficent generosity and untiring energy of those who have been directly connected with the development of the enterprise, that these magnificent results, all of which we are so justly proud, have been made possible.

“ Before I close, I wish to say a word especially to the students of the textile schools, calling their particular attention to points which I think are of sufficient importance to deserve their most careful consideration. Most of you, if not all, are aiming to be at some time (and the sooner the better) a manufacturer or mill manager, and to make a successful manufacturer or manager, there is certainly much required aside from the mere theory and practice as prescribed by this course or that course of study, no matter how carefully followed out.

“ I do not refer to the commercial or business end, for an understanding of this will come more or less naturally with age and experience, but I refer first to matters concerning our dealing with our own superiors (and we always have them,) with our associates and with our employes, or those who may be under our control.

“ Unfortunately, it seems difficult with some of the young men of the present generation to be considerate and gentlemanly under all circumstances. A manager who is not a gentleman is like one who goes to ride in his automobile and forgets to take off the brake; he gets along may be, but his progress must necessarily be slow and with a large increased expenditure of power.

“ I realize that I may be in no position, myself, to lecture on this subject, but we see so often young men, who, as they climb the ladder of success, become more arrogant and more thoughtless of the rights and feelings of others, that I cannot but feel justified in speaking as I do.

“ Again, the successful manager of today must not only have a thorough knowledge of his art, but he must be able to control satisfactorily the employes who may be under his charge. When I say ‘ control satisfactorily ’ I mean not alone satisfactorily to his employers, but satisfactorily to his employes, satisfying both at the same time. As time goes on, and the problem seems more and more difficult, it becomes the student of today to consider and study carefully the various phases which this question presents.

“ To this extent, however, your course is clear. Train yourselves to fairness and consistency. Train yourselves to think before you speak, to firmness tempered as far as possible with kindness. Be careful in forming your laws and force them to the letter, until you see fit to repeal or modify them whenever you are convinced that the best interests demand it. You cannot allow your employes to run over you, and you must not allow yourselves to run over them. Remember that ignorance is responsible for many things, so be at least just to those who have not had your advantages.

“ Gentlemen of the Lowell Textile School, in closing I wish to express my appreciation for the opportunity to be present at the dedication of your school, and I think that I am justified in guaranteeing to you that in the course of time, or as soon as your methods and your equipments are fully understood, you will receive the generous support and coöperation which you deserve from every textile manufacturer in America.

Mr. James T. Smith. *Read*

The Chairman : "Although the establishment of this school was proposed early in 1891, it was not until six years later that its sessions actually began. During all this time quiet but active work was being done to prepare the way for it, and to the far-sighted, unceasing efforts of Trustee James T. Smith the school will always be deeply indebted for its success.

I take pleasure in introducing Mr. Smith, who has been aptly called "The Father of the Lowell Textile School."

*Jump to page 28*  
THE LOWELL TEXTILE SCHOOL.

"The hour and arrangements for transportation will not admit of very full treatment of this subject at this stage of the proceedings. As this great school has grown under our hands we have looked forward to a day like this when in the presence of the official representatives of the Commonwealth and of its leading industry and educational institutions it would not be necessary for one to rise to the topic assigned me, for a great poly-textile institute imposingly and commodiously housed, generously equipped, with an able and experienced corp of instructors would speak more intelligibly and interestingly for itself.

"Its phenomenal growth has attracted wide attention at home and abroad and various have been the impressions as to its character. At first it was associated in the public mind with manual training and trade schools; in providing for evening instruction it was hailed as humanitarian—a great charity of that better sort that gives opportunity to its beneficiaries to advance and does not pauperize them, but as its branches spread and new Departments or Schools continued to develop it was dignified with the title of University. It has, however, resisted all efforts to classify it. It met a demand from the graduates of the higher educational institutions for thorough instruction in applied textiles. But pupils from the public schools, and these comprised about four-fifths of the applicants for day instruction, required also thorough instruction in general chemistry, mechanical engineering, advanced mathematics, and decorative art. Then the operatives in our mills and shops with limited schooling and means, required short practical



evening courses. And our curriculum has grown and broadened as the demand came. There has always been a clear, definite object in view, and to that fact is the rapid development of the school to be ascribed; that object was the needs of the textile industry, and that these might be met intelligently we provided in our articles of association that three-fourths of the permanent trustees "shall be actually engaged in or connected with textile or kindred manufacture."

"Of the 120 pupils taking the regular day courses, 20 are from the higher general educational schools,—the universities and colleges; 82 from the high schools and academies; and 10 from grammar schools. The 438 pupils of the evening classes are mostly from the mills and shops of Lowell and Lawrence and vicinity, though there are those who come four evenings a week from commercial houses of Boston handling textiles. Though we have graduated but four classes, our graduates are well represented in the higher positions of textile manufacture and distribution as superintendents, assistant superintendents, chemists, designers, salesmen, etc., and in the national customs and purchasing bureaus and we have not been able to supply the demand.

"The school did not originate in local pride but local need. At the outset it was conceived as a business enterprise though, apart from original experimental work, the fact that no benefit could come to the textile manufacturer, except through the technical education of his employes and the bright youth from our public schools who sought a textile career, added zest to our work; it is of the best form of charities—it gives opportunity to its beneficiaries to help themselves.

"The school originated in a movement to advance the material interests of this community. While the public demand was for new industries and was partially met until the business collapse of 1893, my attention as an officer of an association of business men was early attracted to the character of our textile products and the small value we added to the raw material. While great variety of textile manufacture had been introduced we were mainly making the coarser plain cottons, the annual output of Lowell mills being estimated at one hundred and fifty miles of cloth per annum. Not only did wages rate low but Southern competition



was increasing and apparently the great industry, the manufacture of coarse plain cotton, that first established here had not only laid the foundation of the prosperity of the great Merrimack water shed but of the commercial metropolis of New England, was leaving the State and, if the political economists were correct, that the cost of the necessities of life determined the wage, leaving it permanently. While we were exporting some \$27,000,000 of these coarse textiles annually, largely to the Eastern Asiatic markets, we were importing nearly \$100,000,000, mostly of the finer grades. How had the foreign manufacturer met our competition in the coarser lines? Evidently by raising the grade of his products. Correspondence with our foreign agents abroad, every facility for which was furnished by the national Department of State, and the publications of its exceedingly valuable bureau of foreign commerce, and of the department of education soon disclosed the fact that technical education was a main reliance abroad for creating a class of experts and operatives required for this higher grade manufacture, and the character, scope and practical results of the textile schools of Germany, England, Russia, Switzerland and France were very thoroughly and carefully studied. It early became evident that the need of Lowell was the need of the textile industry of the entire Commonwealth, and the school has therefore taken the character of a State institution.

“ But such a school as was required must necessarily embrace all textile fibres and processes and thorough instruction in the arts and sciences applied in textile manufacture, and it would cost a lot of money; one million dollars was my estimate including necessary endowments; and it was not until the assurance of German manufacturers that should the government withhold support they would sustain the schools because of the value they were to them was had, that I ventured to propose one of this comprehensive character here.

“ Failing to develop it out of the Middlesex Mechanics Association, and President Walker of the Massachusetts Institute of Technology, although receiving the proposition favorably, not seeing his way clearly to its early establishment here as a department of the Institute, in the fall of 1894, I invited the representatives of our mill corporations to conference and laid before them the

facts I had gathered and my conclusions. From the first the proposition was received favorably, almost with enthusiasm, and under an act passed at the session of 1895 (Chapter 475) the corporation styled the "Trustees of the Lowell Textile School" was formed, in the language of the act, "for the purpose of establishing and maintaining a textile school for instruction in the theory and practical art of textile and kindred branches of industry."

"Having thus been somewhat instrumental in getting my associates into this scrape I have felt under obligations to give the best that was in me to carry out the original scheme and make it a success. It has held me by the fascination that new and untried fields always have.

"We have asked the state to aid us during the period of housing and development believing that when thus lifted up in the sight of the public, and our graduates and the original work of our experts in multiplying and perfecting textile processes had demonstrated the value of the institution, it would become as firmly established in the confidence and support of the American textile manufacturer as are the great textile schools abroad, and our faith has not been in vain as the generous contributions and steadily growing interest in textile circles evidence.

"The complimentary title Chairman Hobbs has been pleased to bestow on me calls for some explanation.

"A veteran of the civil war in fighting over his battles was asked by his little son, "Papa, didn't you have any one to help you." The results you see here are the work of many minds, mostly rich in business experience and charged with great industrial and commercial responsibilities, the successors of those who established textile manufacture in the wilderness of the Merrimack valley,—the founders of the textile industry on this continent. President Cumnock has attempted to give credit, but words fail to indicate the value and importance of the service thus rendered.

"While the Middlesex Mechanics Association about 1835, amended its charter or constitution to provide for classes and instructors in the industrial arts and sciences, it appears to have gone no farther. About 1870, Charles L. Hildreth, Supt. of the Lowell Machine Shop, while chairman of the City Council Committee on

lands and buildings and of education, in constructing the Green grammar school, provided a large circular hall for mechanical drawing and a high storied, well lighted basement for the installation of textile machinery; and Prof. Channing Whitaker of his engineering staff, for 10 years chief of the Department of Mechanical Engineering of the Massachusetts Institute of Technology, developed therein what is now our public evening drawing school. That Mr. Hildreth should be the earliest and most liberal contributor to the equipment of this school would naturally be expected. He first gave a complete plant for cotton yarn making and then when he had introduced the making of worsted yarn machinery, completed our plant for that purpose it now covering every possible quality of output, and in an emergency came down to the school with his staff and developed a system of instruction in cotton yarn making, which leaves nothing to be desired and has served as a model for other schools. I have referred thus particularly to the work of Mr. Hildreth and his assistants, because we have been criticised for giving so much space on our floors to one maker to the possible exclusion of others. It should be understood that we aim to reproduce mill conditions in our manufacturing department, and cannot accommodate all textile machinery makers. The essential principles of yarn manufacture can be fully taught and illustrated with any of the standard makes. It must be borne in mind that one object in locating the school in the vicinity of the mills, was that they would be valuable adjuncts thereto, their equipment being substantially at our service, our pupils frequently visiting the mills in charge of their instructors. Justice to our students requires that they should go out from the school thoroughly familiar with all standard makes of textile machinery, that they may have to use in textile manufacture, and this is now fully assured either in our manufacturing departments or in the department of mechanical engineering, by full working machines or models or drawings. In our former cramped quarters we were unable to gratify the desire of makers as fully as we wished. Today, however, more makes of textile machinery are included in our equipment than have ever before been assembled at one educational institution, thanks to the

liberality of makers and mainly to the energetic and intelligent labor of Chairman Alvin S. Lyon, agent of the Bigelow Co., and his associates of the general equipment committee.

"At the outset, the usefulness of the foreign schools to the industries they represented was clearly demonstrated but would they be as successful under American conditions? In its earlier development our enterprise was therefore necessarily an experiment. An American system of instruction had to be evolved. In Germany something like uniformity of method obtained but in England with the exception of a few schools, established by the cloth Guild of London, schools everywhere had been suddenly created by an extraordinary liberal grant by Parliament under the spur of rapidly increasing German rivalry in foreign and domestic markets, the result being as President Mather of the National Association of technical schools declared, confusion in methods with results not in proportion to the expenditure. Having the experience of England in mind we feared extravagance rather than parsimony at the outset in the grants of public money for textile education. Pursuing a conservative course we rented rooms and cautiously developed our American system of textile instruction, making some mistakes at first. We hoped that as our graduates located throughout the state, evening schools would spring up at the textile centres, and, if need arose, in the larger centres the more expensive day courses would follow. Thus a uniform and economical system of textile education throughout the Commonwealth would result. Wherever schools have, in the judgment of the local manufacturers, been demanded, they have received our heartiest co-operation and support.

*two* "We sent our first director to Germany to observe methods and obtain the technical forms used in instruction at the textile schools, but found finally in the leading American technical schools, especially the Massachusetts Institute of Technology, the best models for instruction in the sciences and the theory of the textile and kindred industrial arts. With limited means, as the usefulness of the school would depend on the quality of its graduates, we have confined our salary expenditures to chief and assistant instructors, the chief of the department of mechanical engineering serving also as principal of the school. He was



graduated and had been assistant instructor in mechanical engineering at the Massachusetts Institute of Technology, followed by practical experience in the line of his profession. Principal William W. Crosby has ably and fully met the requirements of the arduous responsibilities of his dual position. Of our able chief instructors two were graduated with first honors at the older English Textile Schools, and afterwards made high records in their specialties with American manufacturers. We have also drawn liberally on the Institute and other leading technical and scientific schools and have a corps of instructors of which we are proud. Much original and experimental work has been required of them, and they have fully and ably met the demands of the manufacturer and the national department of agriculture. This work is steadily growing in importance.

"This year we expect to complete our buildings and equipment, and to open in October with every department comfortably housed and completely equipped and officered. Future growth is most strongly indicated in mechanical and electrical engineering, decorative art, dyeing, finishing and weaving, although new departments will undoubtedly develop from time to time out of our general lecture course, which covers a wide range of subjects.

Mr. Smith then read two out of many letters received in response to invitations to be present, and expressing regret at the writers' inability to respond in person. The first was from Speaker J. J. Myers of the House of Representatives and the second was from Mr. Frederick Fanning Ayer, one of the munificent benefactors of the school, who wrote as follows :

*Mr. F. F. Ayer's Letter.*

NEW YORK CITY, Nov. 10, 1902.

James T. Smith, Esq.,

Clerk of the Lowell Textile School Trustees, Lowell, Mass.

Dear Sir :

"I have your letter communicating the invitation of the committee on dedication of the new Textile School buildings to attend the dedication exercises and deliver an address. I wish to thank the committee for such invitation, which is heartily appreciated. I regret that circumstances will prevent my being with

you on such ascendant occasion. My first wishes will be there for all that can come to your happy undertaking of continued prosperity in what cannot fail to prove a chapter of unique usefulness in your community.

“ Much is to be looked for from this new scholarship of prints and dye pots and machines. It has a flush of youth in it, not having come down to us from the ancient Romans ; it is the life national which makes for a larger competence for all, which means more happiness to the square inch—it is a new learning which turns your Greek verb out to pasture—it weaves a diadem of peace, which puts your conquering armies to one side. Time will come down when the swish of arms will go down against the thunder of the loom. Art makes for peace, and peace for betterment. Brutality will play no part in the new era. Disputes will come, but it will be found better to talk them out than to fight them out. Against the school of arms is arrayed the school of fingers. It is a fight to a finish. Slaughter for any purpose, will have to go. Your textile schools have said it. Education which shapes brain only is one-sided. Heart and hand need more attention. Certain it is you will not get the best in a man by putting him through the college of blood. Here is my reason for standing by you, because for a first time in history you offer a liberal education. The time-built colleges do not. They stick to the old narrowness—are mere brain-trainers or logic-choppers, as Carlyle would put it. Man is many sided, and must be many ways trained to get the full of him. Another thing is this : The struggle for existence increases with the increase of population. Your textile schools get back at this to lessen the struggle by teaching a higher skilled handicraft, which will allow men to get a living without being quillified to read the Odyssey at sight. No hardship is done ; the back-door is still open to those who prefer dining with Homer “ on a crust.” The first-off portion of education should be to enable men to exist. You may dress them in the ancient classics too, if they can afford the tailor. But existence first, fine feathers afterwards. Think of apprenticing a boy his four best years to a Greek mummy. There are too many millions digging for bread. Your textile school says : We will show you how to dig easier and get more. Lost languages and lost arts



may do to play with when you get time and money, but modern arts will do to work with if you would come to pleasant relations with the baker and the shirt shop. 'Though I am well aware that beauty, ancient or modern, has first rank, I am not the less aware that existence and happiness should have first attention. Everything in its place ; and while the crowded countries of the world are at short licks and a close hug with Nature for existence, the place for the textile school is at the top. Another quarrel I pick with ancient colleges is the top-heavy craft of cramming the head till it gets, often, too full for utterance—the stuffing process, by which a man is taught to admire his own emptiness, and to put the genius of the dead above the possibilities of the living—a scheme to keep the world where it was by inculcating all honor, open arms and knee-bend to an ancient propaganda by courting the perpetual renaissance that teaches men to bring, not themselves, but old prototypes to the front. You may not put your hand to the plow and look back. Such redundancy is there of varieties that no two men ever were the same. Favorable or valuable variations are selected by Nature and put to sprout and blossom for all there is in them. Man has reversed this order of things, and instead of trying to get the best out of a man, tries to get the best into him. Even the old world builders knew better. Education (*e-duco*, to draw out of) had in mind that man is what Nature made him, that you may not add to that, but only draw it forth. But I am yet to learn of an institution in the world which undertakes to discover what is in a man—what basal trait or talent of genius is essentially his, with a view to develop that, bring him out, instead of bringing out Caesar and Demosthenes.

“ Each one has his trait—the trick of doing one thing better than he does others. Such may not be a water diamond always, but it is his diamond, and should have a chance to glisten, being worth more for him than the whole galaxy of ancient star-specks.

“ Nature is above books, the soul, above its law givers. The scholar should become more the teacher, less the learner, and your professor will often do well for the student, and better for himself, to keep his ear cocked and his mouth shut. Schools should be run, not by board of directors only, but by boards of inquiry, divers after pearls, Diognes with his lantern. The elective system,

by which a boy may choose his studies, was a good breakaway from the old moorings ; but what boy of 18 knows what he ought to study, or knows what is in him, or what he is good for? Now he is allowed (formerly he was compelled) to load up with Latin, Greek and metaphysics, to emerge into the world and like as not land behind a show counter when, if fact were known, he had the making in him of a chemist or a sculptor or a composer. Men born of colleges often never discover what they are made for, or find it out too late to bring their cereal to grist. This waste is running to flood, as ever, and most amazing is the apparent fat satisfaction derived by the antiquarians who are gunning it. One of these gave out recently that no man could be a gentleman unless he knew Greek. It was quick to be seen he was not familiar with the language himself, else he would not slap such an insult at the noblemen who though they may not know Greek, run our carders and spinners and to whom he owed a sentiment of better quality—the shirt at his back.

“Less instruction, more inquisition, and you will get at some of the endless varieties of individual bent and mother mark that are now smothered under a dump of rubbish. The textile school squints that way. An open eye to it will come later. There can be no mightier mistake than the neglect of individual characteristics and powers. Next comes the mistake of serving all palates alike, tipping one dish up to every lip, putting the past up for the best that can be done, the archetype of all attainment, Pindar and Pythagoras for all time.

“Let me wish for you in your new field of usefulness, all prosperity to the Textile School.

Faithfully yours,

FREDERICK F. AYER.



# Calendar

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## 1903

Entrance examination for day students, Thursday, Sept. 17, at 10 A. M.

Examination for advanced standing, Thursday, Sept. 24, at 10 A. M.

Entrance examinations for evening students, Thursday, Sept. 24, at 7 P. M.

(for additional examinations for evening classes, see announcement)

School year begins (day) Tuesday, Sept. 29.

Evening school year begins Monday, October 19.

Thanksgiving recess, Thursday, Nov. 26, to Saturday, Nov. 28, inclusive.

Christmas recess, Thursday, Dec. 24, to Monday, Jan. 4, 1903, inclusive.

## 1904

Semi-annual examinations, beginning Wednesday, January 20.

Second term begins Monday, February 1.

Annual examinations begin Wednesday, May 18.

Diplomas awarded Thursday, June 4.

First entrance examinations Thursday, June 2, at 10 A. M.

There will be no sessions of the school on Washington's Birthday or on  
Patriots' Day.

Second entrance examination, Thursday, June 16.









LOWELL TEXTILE SCHOOL  
FROM ACROSS MERRIMACK RIVER

BULLETIN  
OF THE  
Lowell Textile School  
LOWELL, MASS.

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*Issued Quarterly*

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1903 - 1904

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Entered August 25, 1902, at Lowell, Mass., as second class matter,  
under Act of Congress of July 16, 1894.

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*Moody Street and Colonial Avenue*



SOUTHWICK HALL

# Trustees of the Lowell Textile School

*(Incorporated 1895)*

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A. G. POLLARD, Treasurer

A. S. COVEL, Vice President.  
JAMES T. SMITH, Clerk

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New York.

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On the part of the Commonwealth of Massachusetts.

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CECIL L. ADAMS,  
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MICHAEL DUGGAN, June 30, 1904.

By appointment of the Lowell Textile Council

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KITSON HALL  
COTTON YARN DEPARTMENT

Enclaved Stone - C  
The - 1890 -  
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Electric Power Transmission.

HENRY G. KITTREDGE, Textile Expert and Journalist. Fibres.

ARTHUR T. SAFFORD, A. M., Assistant Engineer Locks and Canals Co.,  
Lowell, Mass., Water Power.

WALTER B. SNOW, S. B., with B. F. Sturtevant Co., Boston. The Heating  
and Ventilation of Textile Mills.

CHANNING WHITAKER, S. B., M. E., Adviser of Lowell Machine Shop in  
Questions of Patents. Patent Law.

ARTHUR K. WHITCOMB, A. B., Supt. of Schools, Lowell. How to Study.

C. HOWARD WALKER, Director Mass. School of Design, Boston. Decora-  
tive Art.



COTTON YARN DEPARTMENT  
FLY FRAMES

# CALENDAR

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## 1903

Entrance examination for day students, Thursday, Sept. 17, at 10 a. m.

Examination for advanced standing, Thursday, Sept. 24, at 10 a. m.

Entrance examination for evening students, Thursday, Sept. 24, at 7 p. m.  
(for additional examinations for evening classes, see announcement.)

School year begins (day) Tuesday, Sept. 29.

Evening school year begins Monday, October 19.

Thanksgiving recess, Thursday, Nov. 26, to Saturday, Nov. 28, inclusive.

Christmas recess, Thursday, Dec. 24, to Monday, Jan. 4, 1904, inclusive.

## 1904

Semi-annual examinations, beginning Wednesday, January 20.

Second term begins Monday, February 1.

Annual examinations begins Wednesday, May 18.

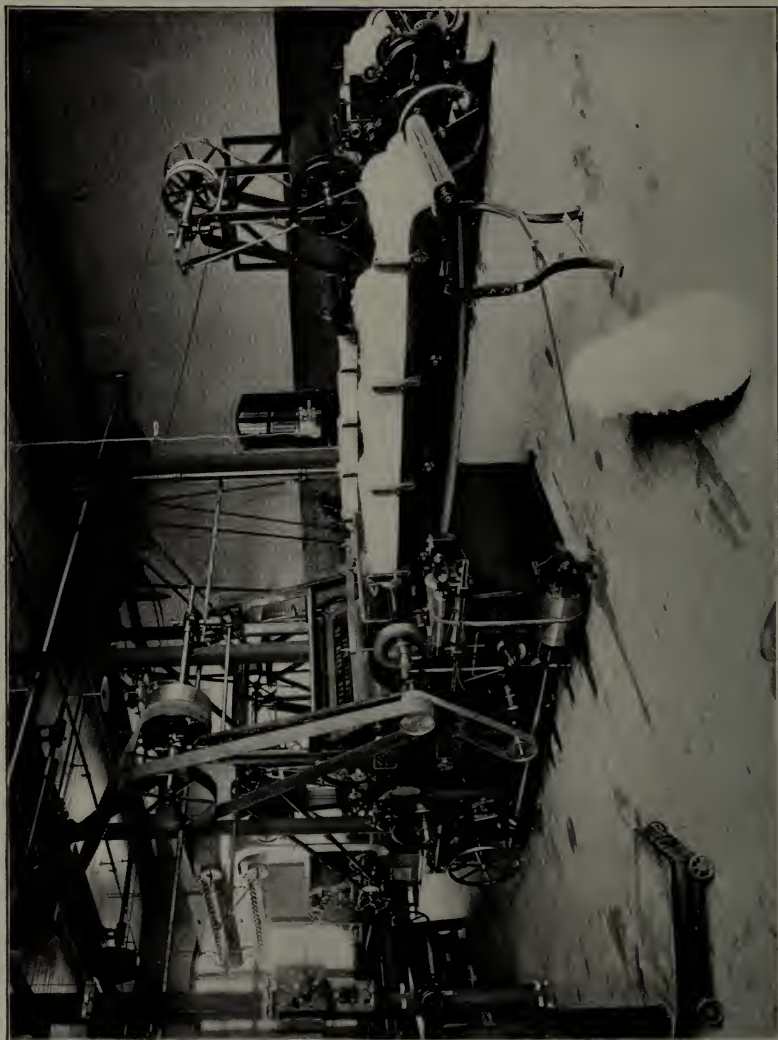
Diplomas awarded Thursday, June 2.

First entrance examinations Thursday, June 2, at 10 a. m.

There will be no sessions of the school on Washington's Birthday or on  
Patriots' Day.

Second entrance examination, Thursday, June 16.





COTTON YARN DEPARTMENT  
PICKERS

## The Lowell Textile School.

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The establishing of a school in Lowell for thorough instruction in the theory and practical art of manufacturing all fibres known to the textile industry, although proposed early in 1891, was not determined upon until the organization, methods and scope of such foreign schools, especially in England, France, Switzerland, Germany and Russia, had been carefully studied, and their permanence and value to the textile interests of those countries made clearly apparent.

The "Trustees of the Lowell Textile School" are incorporated under a special act of the Massachusetts Legislature, "for the purpose of establishing and maintaining a Textile school for instruction in the theory and practical art of textile and kindred branches of industry."

The incorporators are mainly representatives either as president, treasurer, agent or superintendent, of the management of the great textile corporations of Lowell, Lawrence and vicinity, in the Merrimack Valley, with an aggregate capital of over \$65,000,000. By the terms of the By-Laws, at least three-fourths of the Trustees must be "persons actually engaged in or connected with textile or kindred manufactures." This insures the practical character of the management and instruction.

The School is located in Lowell, Massachusetts, the "Mother Textile City of America," the city and state affording financial aid, the manufacturers of New England being equally liberal in contributions. The advantages of the location at a textile centre where every commercial fibre enters into the products, the student thus being directly in touch with the textile industry and the management thereof, will be apparant.

The School was formally opened by His Excellency, Gov. Wolcott, on January 30, 1897, in the presence of a large gathering of gentlemen interested in textile industries from all parts of New England. Instruction was commenced on February 1, 1897, and



WOOLEN AND WORSTED YARN DEPARTMENT

the classes have been regularly conducted since that time with ever increasing attendance.

The permanent home of the School was dedicated on February 12, 1903, by His Excellency, Gov. John L. Bates, and a large number of guests representing the great textile manufacturing and commercial interests of the Commonwealth.

As the larger percentage of the students in the regular day classes come directly from the high schools and academies, it has been found necessary to make the curriculum and instruction in the pure science branches especially in General Chemistry, Decorative Art and Mechanics as thorough as in the higher scientific institutions.

The principles of science and art are taught, not with the object of educating professional scientific men, but with a view to industrial and commercial application; but the School offers to graduates of universities and scientific institutions the advantage of technical instruction in the practical application of certain sciences. It also offers special facilities to those entering commercial life for obtaining such knowledge of the construction of textile fabrics and of the languages of foreign commerce as is essential in the marketing of goods abroad.

The equipment of the School consists of high grade machinery with all latest improvements, specially built to afford facilities for all kinds of experimental work, and of such variety as is never found in any one textile mill. With the machinery that is already installed, the School has a more varied equipment than any other existing textile school either in America or Europe, foreign schools being generally confined to instruction in the manipulation of one class of fibres only; namely, that used in the district where the school is located.

The lecturers and instructors are drawn from the the leading scientific and art institutes of Europe and America, including those who have had special experience in textile school work and in the various processes of textile manufacture, the purpose of the management having been from the first to furnish as thorough scientific instruction in textiles and textile machine manufacture, as is furnished by any technological institution in the branches of industry to which it relates.





WOOLEN AND WORSTED  
YARN DEPARTMENT

## Day Classes

These are especially intended for the instruction of those whose intention it is to enter the business of textile manufacturing in any branch. The courses are sufficiently complete to enable one to start without any previous acquaintance with textiles; but at the same time those who have been engaged in such business and wish to improve their knowledge and experience, can devote their entire time to study most profitably.

The complete collection of machinery enables every process to be practically illustrated.

The student has the option of selecting any one of five regular courses.

Each course is intended to cover three years. It is optional whether or not a student continues the full course of three years, but this is strongly recommended.

There is *one term* of preliminary instruction, which is common to all courses. At the end of this term, each student is required to select which of the courses he is to follow in his subsequent studies, and the instruction to be given after the first term of the first year is specialized to suit each course.

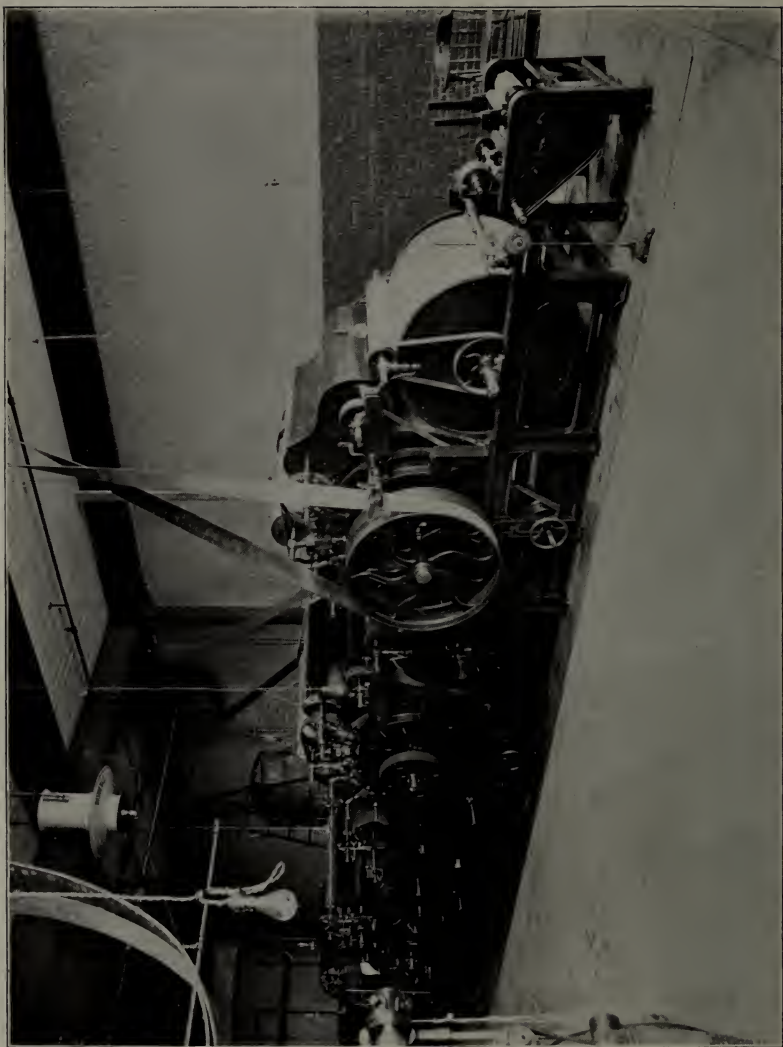
The five regular diploma courses are:

- I. Cotton Manufacturing.
- II. Wool Manufacturing.
- III. Designing. General Course.
- IV. Chemistry and Dyeing.
- V. Weaving.

## Evening Classes

The second branch of the school work is intended to give thorough evening instruction to those who are engaged during the day in mills and work shops, to enable those who wish it, to perfect their knowledge of the branches in which they work, to acquire knowledge of other processes than those in which they are regularly engaged, and in the course of several winters to complete a thorough technical education without interfering with their daily duties.





WORSTED CARD

Evening students have the option of entering for one or more of six different courses, and arrangements will be made as far as possible for them to take such a section of each course as is suited to the student's daily occupation in the mill.

- I. Cotton Spinning.
- II. (a) Woolen Spinning. (b) Worsted Spinning.
- III. Designing.
- IV. Chemistry and Dyeing.
- V. (a) Warp Preparation. (b) Weaving.
- VI. Mechanical Engineering.

Course IV requires four years, courses I and III require three years each; courses II (b) V and VI two years, and course II (a) one year.

For the satisfactory completion of either of these courses, the certificate of the school will be awarded; the diploma of the school will be awarded in exchange for certificates of satisfactory completion of those subjects which go to make up any one of the several regular diploma courses.

In general it is possible to take up the study of two of the above evening courses concurrently.

The time devoted to practical work both day and evening is considerably longer than that devoted to lectures.

### Women's Department

Among the many fields in which woman has entered, none has been found in which her natural refinements of taste and skill can be used to better advantage than in designing; but natural ability, though the prime requisite is by no means all, for a certain amount of technical knowledge must be gained to achieve success. This department combines decorative art and textile design, and in general requires attendance on four afternoons per week.

### Commercial Department

A special course in textile construction and foreign languages is arranged for those contemplating a commercial career.

All such are invited to communicate with the principal, since there is demanded in such a course a greater variety of combinations of studies than in the manufacturing courses.



WORSTED COMB

## The Permanent Home

On January 1st, 1903, the School was transferred from the rented quarters that it had occupied for five years, to the site and buildings where it is permanently located.

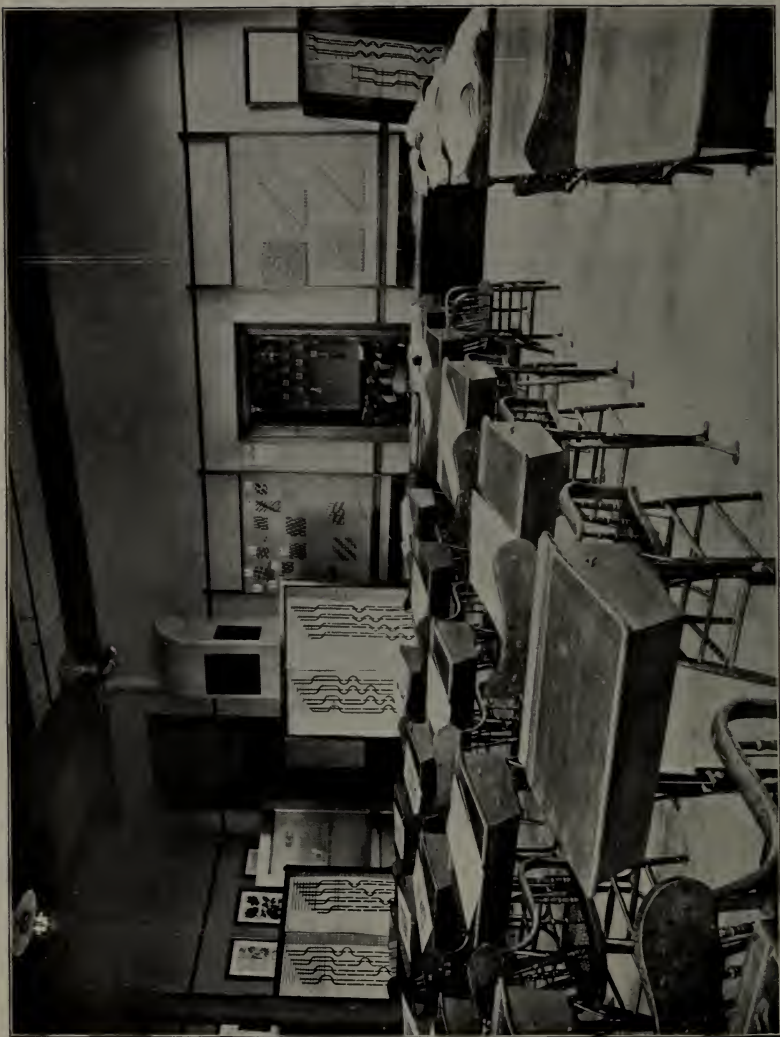
The site is a commanding one, consisting of ten acres at a high elevation, on the west bank of Merrimack River, extending to and overlooking the rapids of Pawtucket Falls, first utilized for power weaving in America on an extensive scale. The site was contributed by Frederic Fanning Ayer, Esq., of New York City and the proprietors of the Locks and Canals of Merrimack River. The buildings consist of Southwick Hall, Kitson Hall and one on Falmouth Street not yet named. The dimensions are as follows:

**Southwick Hall:** The central mass is 90 x 90 ft. having three stories and the wings 80 x 85 ft. with two stories and a well lighted basement. The building is pierced in the centre by an arched way from which access is had to the wings and to the central courtyard.

**Kitson Hall** makes a right angle with Southwick Hall and is 60 x 252 ft. It is one story and a basement and occupied by the Cotton Yarn Department and heating, lighting, ventilating and power plant.

**Falmouth Street Building:** This building forms the third side of a parallelogram and is 75 x 130 ft. and two storied. An extension or head house 70 x 80 ft., three stories and basement, is under contract to be completed Nov. 1, 1903. This building is occupied for weaving and woolen and worsted yarns. The head house will provide for an extension of these departments, for wool scouring, carbonizing, conditioning, etc., and for knitting.

The buildings are all faced with light brick with granite and Indiana lime stone trimming and are of modern mill construction adapted to educational uses. The floor space of the School is quadrupled in the new home permitting of a very large increase in equipment which will be installed during the year 1903. The floor space now occupied by the several departments is as follows:



TEXTILE DESIGN DEPARTMENT



Cotton Spinning, . . . . .	14,000 sq. ft.
Woolen and Worsted Spinning, . . . . .	20,700 " "
Decorative Art and Textile Design, . . . . .	14,000 " "
General Chemistry and Dyeing Laboratories, . . . . .	14,000 " "
Dye House, . . . . .	6,000 " "
Finishing Room, . . . . .	5,000 " "
Power Weaving, . . . . .	15,600 " "
Knitting, . . . . .	5,600 " "
Mechanical and Electrical Engineering . . . . .	8,600 " "

Southwick Hall was contributed by the Commonwealth of Massachusetts and Frederic Fanning Ayer, Esquire, of New York City and is a memorial to Royal Southwick, a leading textile manufacturer and public man of earlier days, a maternal ancestor of Mr. Ayer.

Kitson Hall was contributed by Charlotte P. Kitson and Emma K. Stott, daughters of Richard Kitson, to whose memory it is dedicated, who founded the Kitson Machine Company of Lowell which company was also a generous contributor.

## Equipments

The equipment of machinery is the most varied in the world for textile educational purposes; the machinery and plant already in place is of a value of \$475,000, and is such as to enable all commercial fibres to be treated in the School at every process until they become a woven fabric.

### The Equipment of the Cotton Spinning Department Includes :

One process system of Kitson Picking Machinery from works of Kitson Machine Co., Lowell Mass., as follows:

One Number Seven Opener with Automatic Feeder connected by Robinson Patent Cleaning Trunk to  
One 40" one Beater Breaker Lapper with Condenser and Guage Box Feed.





FABRIC STRUCTURE AND  
CLOTH ANALYSIS

One 40" one Beater Intermediate Finisher Lapper with Perham and Davis Sectional Plate Evener, apron to double four laps.

One 40" one Beater Finisher Lapper with Perham & Davis Sectional Plate Evener, apron to double four times, Kirschner Pat. Carding Beater.

One Roving Waste Opener.

One Thread Extractor.

Card Grinding Rolls, Stripping Rolls, etc.

One Sliver Lap Machine, made by the Mason Machine Works, Taunton, Mass.

One Comb, made by the Mason Machine Works, Taunton, Mass.

The following machinery from the Lowell Machine Shop, Lowell, Mass. :

One Top Flat Card.

Three Revolving Flat Cards.

Two Railway Heads.

Two Drawing Frames.

One Slubber.

One Intermediate.

One Fine Frame.

One Jack Frame.

Three Ring Spinning Frames.

One Spinning Mule.

One Spooler.

Wet and Dry Twister.

One Reel.

One 50 Saw Pratt Gin.

One Prior Roller Gin.

One Weeks Banding Machine. ( Draper Co.)

Wet and Dry Twister, made by the Draper Co., Hopedale, Mass.

Wool Scouring Machinery made by C. G. Sargent's Sons, Graniteville, Mass., consisting of :

One Automatic Feeder.

One Scouring Bowl, 17' x 24".

One Scouring Bowl, 10' x 24".

One Single Apron Dryer.



STUDIO,  
DECORATIVE ART DEPARTMENT

## The Woolen Spinning Department Includes :

One Parkhurst Burr Picker, made by the Atlas Mfg. Co., Newark, N. J.

One Mixing Picker, made by the Davis & Furber Machine Co., North Andover, Mass., equipped with Improved Mixing Picker Feed, and Spencer Oiler, made by G. S. Harwood & Sons, Boston, Mass.

One set of Woolen Cards, including :

First Breaker, Second Breaker and Finisher, made by the Davis & Furber Machine Co., North Andover, Mass. ; This set of cards equipped with Bramwell First Breaker Feed, made by G. S. Harwood & Sons, Boston, Mass. ; Torrance Balling Head and Creel, (made by the Torrance Mfg. Co., Harrison, N. J.) between First Breaker and Second Breaker ; Apperly Feed, (made by G. S. Harwood & Sons, Boston, Mass.,) between Second Breaker and Finisher, and Combination Rub Rolls and Apron Condenser, (made by the Davis & Furber Machine Co., North Andover, Mass.,) on finisher. These cards are for medium and coarse work.

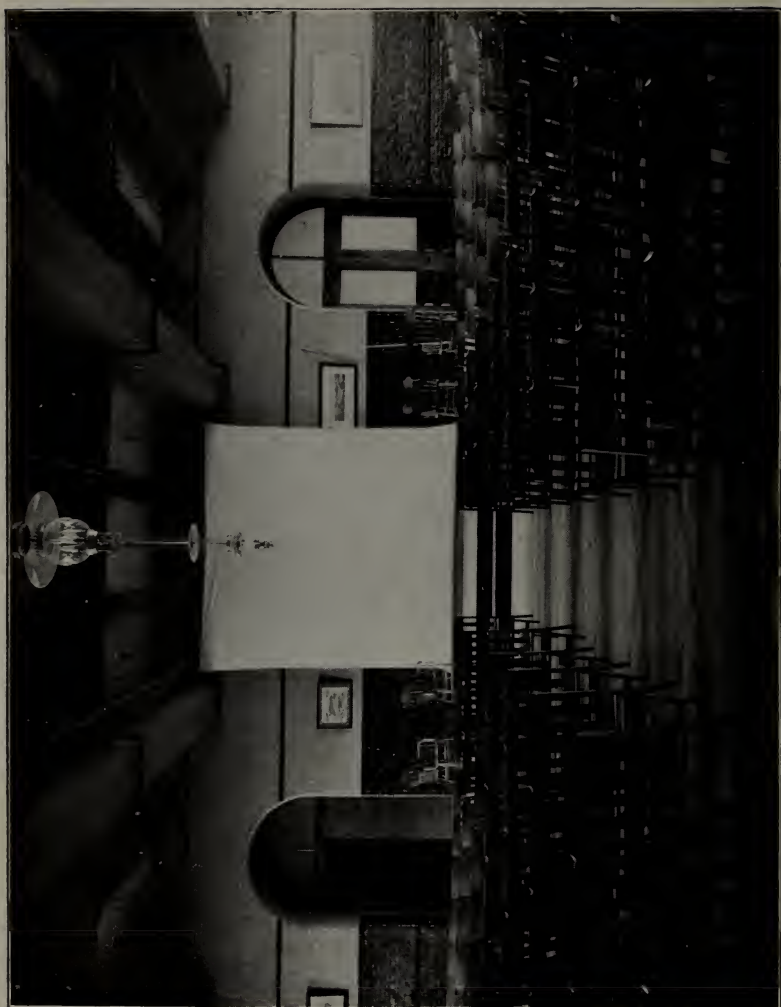
One set of Davis & Furber Woolen Cards, including :

First Breaker, Second Breaker and Finisher. This set of cards equipped with Bramwell First Breaker Feed, (made by G. S. Harwood & Sons, Boston, Mass. ; ) Apperly Feed, (made by G. S. Harwood & Sons, Boston, Mass.,) between First Breaker and Second Breaker ; Bates Feed, (made by V. S. Bates, Lowell, Mass.,) between Second Breaker and Finisher, and Davis & Furber Double Apron Condenser, on Finisher. These cards are for fine work.

One Spinning Mule, 120 spindles, made by the Davis & Furber Machine Co., North Andover, Mass. ; Bobbin Holder, supplied by Murdock & Geb, Franklin, Mass., and American Bobbin Holder Co., W. Medway, Mass.

One Twister, made by the Davis & Furber Machine Co., North Andover, Mass.

One Roy Grinding Frame, made by B. S. Roy, Worcester, Mass.



MAIN ASSEMBLY HALL

One Roy Traverse Grinder, made by B. S. Roy, Worcester, Mass.

One Sample Mixing Card, made by the Torrance Mfg. Co., Harrison, N. J.

### The Worsted Spinning Department Includes :

One 50-inch Double Worsted Card (4 lickerin,) made by the Davis & Furber Machine Co., North Andover, Mass.

One Doubling Balling Head Gill Box (with double screws) made by Lowell Machine Shop, Lowell, Mass.

One Weigh Gill Box and Creel, made by Lowell Machine Shop, Lowell, Mass.

One Baller, (punch) made by Crompton & Knowles, Worcester, Mass.

One Noble Worsted Comb, made by Crompton & Knowles, Worcester, Mass.

One Can Finishing Gill Box, made by Hall & Stell, Keighley, England.

One Balling Head Finishing Gill Box, made by Hall & Stell, Keighley, England.

The following Drawing, Spinning and Twisting Machinery from Prince Smith & Son, Keighley, England :

One Revolving Creel for 12 Balls.

One Double Head Can Gill Box.

One 2 Spindle Gill Box.

One 2 Spindle Drawing Box.

One 2 Spindle Weigh Box.

One 4 Spindle First Finisher.

One 12 Spindle Dandy Reducer.

One 12 Spindle Cap Spinner.

One 12 Spindle Flyer Spinner.

One 12 Spindle Ring Spinner.

One 12 Spindle 2 Fold Cap Twister.

One 12 Spindle 6 Fold Ring Twister.

The following Drawing, Spinning and Twisting machinery from the Lowell Machine Shop, Lowell, Mass. :

One 2 Spindle Drawing Box.





GENERAL CHEMISTRY LECTURE ROOM

- One 6 Spindle Second Finisher.
- One 24 Spindle Dandy Rover.
- One 48 Spindle Cap Spinner (4 foot end.)
- One 48 Spindle Cap Spinner (5 foot end.)
- One 48 Spindle Boyd Ring Twister.
- One 6 Spindle Cone Reducer.
- One 8 Spindle Cone Rover.
- One Six Gang Universal Winder, equipped for cones or straight tubes, made by the Universal Winding Co., Boston, Mass.

### The Cotton Warp Preparation Department Includes :

- One Spooler, made by the Lowell Machine Shop, Lowell, Mass.
- One Warper, made by the Lowell Machine Shop, Lowell, Mass.
- One Slasher, made by the Lowell Machine Shop, Lowell, Mass.
- One Beamer, made by T. C. Entwistle, Lowell, Mass.
- One Winder, made by Altemus & Co., Philadelphia, Pa.
- Drawing-in Frames, etc.

### The Woolen and Worsted Warp Preparation Department Includes :

- One Warp Spooler.
- One Dresser.
- One Reel.
- One Beamer.
- One 48 Spool Creel.
- All made by the Davis & Furber Machine Co., North Andover, Mass.
- Also a number of hand warping and beaming frames.

### The Power Weaving Department,

which is the most complete in the world, with regard to the variety of looms, includes :

- One plain Northrop Loom, made by the Draper Co., Hopedale, Mass.



GENERAL CHEMISTRY  
PREPARATION LABORATORY

- One Improved Northrop Loom, fine sateen, made by the Draper Co., Hopedale, Mass.
- One Plain Print Cloth Loom, made by the Whitin Machine Works, Whitinsville, Mass.
- One Side Cam Twill Loom, made by the Whitin Machine Works, Whitinsville, Mass.
- One Five Harness Sateen Loom, made by the Lowell Machine Shop, Lowell, Mass.
- One Plain Print Cloth Loom, made by the Mason Machine Works, Taunton, Mass.
- One Harriman Automatic Shuttle Changing Loom.
- And the following looms made by the Crompton-Knowles Loom Works, Worcester, Mass., and Providence, R. I.
- One Model Dobby Attachments.
- One Knowles Gingham Loom, 4 boxes.
- One Knowles Fancy Cotton Loom, with 20 harness dobbie, 4 boxes, for fancy leno work.
- One Knowles Fancy Cotton Loom, with 25 harness dobbie.
- One Knowles Blanket Loom, with 25 harness dobbie, 4 boxes.
- One Knowles Gem Loom, 20 harness, 4 x 4 boxes.
- One Knowles Worsted Loom, 32 harness 4 x 4 boxes.
- One Knowles Fancy Loom, with single lift Jacquard.
- One Knowles Fancy Loom, with double lift Jacquard.
- One Knowles Fancy Loom, with Jacquard tied up for leno.
- One 1200 Hook Halton Jacquard Head Motion, arranged to be transferred to different looms.
- One Knowles Ingrain Carpet Loom, 4x4 boxes.
- One Crompton Gingham Loom, 4x1 boxes.
- One Crompton Fancy Loom, 6x1, with double cylinder, 20 harness dobbie.
- One Crompton Fancy Cotton Loom, with single cylinder 20 harness dobbie.
- One Crompton Jean Loom.
- One Stafford 36 inch 20 harness Cotton Loom, Geo. W. Stafford, Readville, Mass.
- One Crompton Lappet Loom, with 16 harness dobbie.
- One Crompton Towel Loom, 2x1 boxes.
- One Crompton Ingrain Carpet Loom, 4x4 boxes.



DYEING LABORATORY  
SAMPLE PRINTING MACHINE

One Crompton Worsted Loom, 27 harness.  
One Crompton Worsted Loom, 24 harness, 4x4 boxes.  
One Crompton & Knowles Heavy Loom, 20 harness 4x4 boxes.  
One Lewiston Machine Co. Loom, 4 harness, side cam.  
One Lewiston Machine Co., Bag Loom.  
One Kilburn & Lincoln Plain Loom.  
One Kilburn & Lincoln Fancy Loom, 2x2 boxes.

There are also the following hand looms, viz. :

Twelve Hand Looms, 2x3 boxes, with 20 harness dobby.  
Eight Hand Looms, 4x4 boxes, with 24 harness dobby.  
Six Hand Looms, 3x3 boxes, with 32 harness dobby.  
Six Hand Looms, 4x4 boxes, with 30 harness dobby.  
Two Hand Looms, with treadles.  
Two Hand Looms, 4x4 boxes, with 200 hook Jacquard.  
Two Hand Looms, 3x3 boxes, 200 hook Jacquard.  
Two Hand Looms, 3x3 boxes, with 600 hook Jacquard.  
One Jacquard Piano Card Cutting Machine, from John Royle  
& Sons, Paterson, N. J.

### The Silk Machinery Consists of :

One Winder.  
One Quiller.  
One Warper.  
One Beamer.  
One Doubling Frame.

All made by the Atwood Machine Co., Stonington, Conn.

### The Chemical Laboratories are Equipped as Follows :

The General Chemistry and Qualitative Analysis Laboratory includes:

Ninety-six laboratory desks, each containing a full set of apparatus for the first year's work in chemistry; also gas and water fittings, re-agents and sinks.  
Four Large Double Hoods.  
Two Steam Baths.





EXPERIMENTAL DYEING LABORATORY

### The Quantitative Laboratory Includes:

One Water Distilling Apparatus.  
One Steam Drying Closet.  
One Large Steam Bath.  
One Electrolytic Table.  
Five Hoods.  
Eighteen laboratory desks, each fully provided with apparatus.

### The Balance Room Contains:

One Standinger Analytical Balance.  
One Eimer & Amend Analytical Balance.  
Two H. L. Becker's Son & Co. Analytical Balances.

### The Combustion Room Includes:

One Combustion Furnace, 25 burners.  
One Lothar Meyer's Furnace for tubes.  
One Kerosene Burner Muffle Furnace.

### The Microscopical and Volumetric Laboratory Includes:

Two Benches for volumetric analysis.  
Two Benches for microscopical work.  
One Bausch & Lomb Compound Microscope.  
One Nachet et Fils Compound Microscope.  
Desks and shelves for the apparatus and re-agents necessary for this branch of the work.

### The Assistant Instructors' Laboratory Includes:

One Large Case for chemicals.  
One Double Hood.  
One Copper Water Bath.  
One Soapstone Sink with a drain board.  
Benches, desks and complete fittings for water, gas and suction.



WEAVE ROOM

## The Chemical Lecture Room Includes :

A lecture table fully equipped with gas, water, sinks, a hood and sufficient apparatus for lecture experiments.

Seats are provided for 80 students, being arranged on a raised floor so that every student has a full view of the lecture table.

## Experimental Dyeing Department

The dyeing laboratory is equipped with individual benches, small dyeing apparatus, reels, balances, apparatus for dye-testing, such as frames for exposing dyed material to light, and a complete collection of dyestuff samples and sample cards.

One Small Hydro Extractor, from W. H. Tolhurst & Sons, Troy, N. Y.

One Drying Chamber.

One Ageing Chamber.

The private dyeing laboratory is well equipped with the necessary apparatus for experimental dyeing and research work.

## Printing Department

One Calico Printing Machine, made by Mather & Platt, Oldham, England.

One Jacketed Iron Steaming Chamber from A. Edmeston & Son, Salford, England.

One Set of Steam Jacketed Copper Kettles.

## Knitting Department

One Mayo Automatic Seamless Knitting Machine.

One Spring Needle Cut Hose Machine.

One Latch Needle Ribbed Hose Machine.

The Head House now erecting will provide space for a complete knitting equipment hitherto impossible.

## Dyeing and Finishing Departments

Owing to the limited space available at the old school, the practical work of these departments was conducted in a series of lectures and visits to the neighboring mills, the several corporations having kindly placed portions of their equipment at the disposal of the school for this purpose.



WEAVE ROOM



At the present time there are on hand or building the following machines:

One Rodney Hunt 2 String Washer.

One Rodney Hunt Fulling Mill.

One  $\frac{6}{4}$  Double Shear from Parks & Woolson.

One  $\frac{6}{4}$  Voelker Rotary Press.

One Sewing Machine, Birch Brothers.

One Measuring Machine, from Fabric Measuring and Packaging Co.

One Kier, from Atlantic Works.

One 4 String Dyeing Machine from Rodney Hunt Machine Co.

One Mercerizing Machine.

One Raw Stock Dyeing Machine, Klauder-Weldon Dyeing Machine Co.

The remaining machinery and apparatus necessary for the complete outfit in dyeing and finishing is to be put in place during the year.

### Fibre Testing Laboratory

Through the generosity of a friend of the School a new laboratory will be fitted up during the summer which will be provided with the most approved apparatus for testing the physical properties of all fibres, yarns and fabrics. The microscopic outfit is already in use, and provides,

One Bausch and Lomb D. D. Microscope.

Two inch, 1 inch, and  $\frac{1}{2}$  inch regular eyepieces.

Three-fourths inch (photographic,)  $\frac{2}{3}$  inch,  $\frac{1}{6}$  inch,  $\frac{1}{12}$  inch (oil immersion) objectives.

One Nicol prism polarizer and analyzer.

One Eye Piece Micrometer.

One Filar Micrometer, (1 inch equivalent eye piece) for refined diameter determinations.

One Standard Glass Stage, divided to  $\frac{1}{10}$  and  $\frac{1}{100}$  m. m., with corrections as tested against the International m. m.

Complete outfit for mounting slides.

Complete outfit for photo micrography.

One specially designed single fibre testing machine, graduated to  $\frac{1}{40}$  m. m., and sensitive to 1 m. g. weight.





WEAVE ROOM

- One Small Skein Testing Machine, reading to  $\frac{1}{10}$  m. m. deflections and 5 gram loads.
- One set Conditioning Ovens for moisture determination.
- One set Sample Scouring Bowls for determining foreign matter in fibres.
- One Yarn Testing Machine, adjusted to test strength, twist, take up, elasticity, and stretch.
- One Cloth Strength Testing Machine.

### Power, Light, Heat and Ventilation

- Two 100 H. P. Stirling Water Tube Boilers.
- One Sturtevant Induced Draft Apparatus, including fan, direct connected to the Sturtevant vertical engine and two way dampers.
- One Sturtevant Smoke Filtering Apparatus.
- One Foster Reducing Valve used as automatic pressure regulator for draft engine.
- One Locke Steam Pressure Regulator for draft engine.
- One Knowles Boiler Feed Pump, 6" x 4" x 6".
- One Warren Webster Feed Water Filter, heater and oil extractor.
- One Payne 14" x 14" Automatic High Speed Engine of 125 H. P. and 260 r. p. m.
- One 9½" x 11¾" Nash Gas Engine of 50 H. P. of the three cylinder type, with speed regulating clutch and hit and miss governor.
- One Motor Driven Air Compressor 5½" x 6" with a storage tank of 20 cubic feet capacity, 100 lbs. per sq. in. pressure.
- One Complete Sturtevant Double Duct System for heating and ventilating Southwick Hall. This apparatus is designed to provide the proper amount of fresh warm air called for by the State law as applied to educational institutions, and includes a 9ft. x 4ft. fan direct connected to the Sturtevant horizontal engine, drip tank and Knowles automatic return pump, 4½" x 2¾" x 4" arranged to deliver either to the feed water heater or to the boilers direct.
- One Sturtevant Fan and Heater for Kitson Hall and Falmouth Street Building, direct connected to a Sturtevant inverted engine.



WEAVE ROOM

One Cross Oil Filter.

One Complete Moistening Apparatus installed by the American Moistening Co., Boston, Mass., including Knowles triplex 4 x 4 power pump, tank, and 18 moistening heads.

One Complete Sprinkler System for fire protection, using the Grinnell glass button heads.

One Bullock 75 K. W. Direct Current Multipolar Compound Generator, wound for 220 volts, over compounded 20 volts from no load to full load and direct connected to the Payne engine.

One Bullock 30 K. W. Generator of the same type, direct connected to the Nash gas engine. The switch board is arranged so that either unit may be thrown in independently on the power or lighting feeders or the two machines may be run in parallel. The lighting circuits are on the two wire 220 volt system and supply the equivalent of 660-16 candle power 220 volt lamps.

Three 24 H. P. Bullock Motors.

Three 15 H. P. Bullock Motors.

One 3 H. P. Motor from New England Motor Co.

One 2 H. P. Motor from New England Motor Co.

One 250 volt Weston Portable Voltmeter.

One 250 volt Weston Portable Voltmeter with calibrating coil.

One 150 ampere Weston Portable Ammeter.

One Weston Portable Millivoltmeter with 200 milli-volt and 20 milli-volt scales.

One Darsonval Reflecting Galvanometer.

One Simple Galvanometer.

One Wheatstone Bridge.

Two Direct Current Self Feeding Arc Lamps.

Two 90° Hand Feed Arc Lamps.

Resistance boxes of various sizes and other apparatus necessary for commercial testing of lamps, motors, etc.

All of the above apparatus is available for experimental work and affords opportunities for laboratory practice for the classes in mechanical and electrical engineering.



ELECTRICAL ENGINEERING LABORATORY



## Day Students

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### Entrance Qualifications

Candidates for admission to the day classes may present to the Principal such evidence as may be obtainable, whether degree, diploma, or certificate, at any time. For all others, there will be held examinations, as stated in calendar ; candidates failing to pass at June examinations will be allowed to try again in September ; those who cannot attend the June examinations, may present themselves in September ; if conditioned, a further examination will be appointed. Preparation in general will be as follows :

### Arithmetic

Definitions ; elementary operations in addition, subtraction, multiplication and division ; squares ; cubes ; square root ; interest, discount ; fractions, simple and complex ; decimals ; percentage ; ratio and proportion. Metric System.

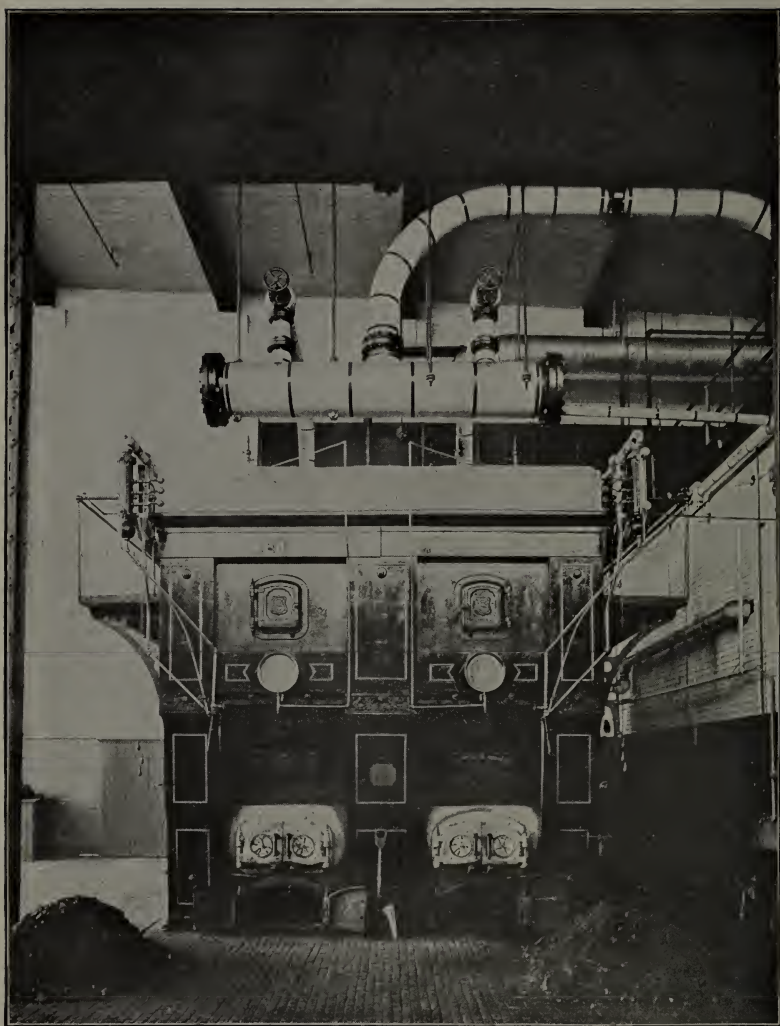
### English

The candidates will be expected to correct examples of bad English, both for spelling, punctuation, capitalization, grammar and sense ; also to write a short composition on a given theme (some familiar one) to show a knowledge of language and method of expression.

### Geography

Location of principal countries, with capitals, large rivers, mountains, etc., noting characteristics of climate, productions and inhabitants. General statements rather than specialization will be sought.





BOILER HOUSE

## Algebra

If conditioned this subject may be passed off during the term.

Definitions ; fundamental operations, parenthesis, factoring ; highest common factor ; least common multiple ; fractions, simple and complex ; simple equations, one or more unknown quantities ; involution and evolution ; square and cube root ; logarithms.

## Geometry

As much plane geometry as is included in any of the generally accepted text books.

## Application Blanks

A blank form of application may be found at the end of this bulletin.

## Bulletins and Catalogue

All students registering and paying the regular fee for the course selected will be entitled to the Bulletins and Catalogue when issued.

Sample copies may be had on application to the Principal.

## Preparatory School

For those who intend to take Chemistry and Dyeing, physics is almost indispensable ; and while the preparation afforded by the modern grammar school will enable the student to complete either of the courses at this school, the increased advantages of the equivalent of a high school training cannot be over-estimated. In such a preparatory course, particular attention should be given to algebra, geometry, manual training, chemistry, physics (including mechanics, heat, light and electricity,) French and German.



MECHANICAL DRAWING ROOM

## Optional Courses

During the present year optional courses are offered in advanced algebra, trigonometry, German, (advanced and elementary.)

It will be noticed in the regular courses several options are given.

## Advanced Standing

Candidates who may have received previous training in any of the subjects ordinarily taken in the regular courses may present themselves for examination as per calendar. If a satisfactory rank be attained, they will be given such further work as will be best suited to their advancement.

## Fees

The fee for the day course is \$100 per year for residents of Massachusetts ; for non-residents it is \$150 per year.

Five-eighths of the fee is payable on or before October 10, the balance on or before February 10, of each year. After payment is made, no fee or part thereof can be returned, except by special action of the trustees.

Special students pay in general, the full fee, but if a course be taken involving attendance at the school during a limited time, application may be made to the Principal for a reduction.

Students must provide their own books, stationery, tools, etc., and pay for any breakage or damage that they cause. The above fee includes free admission to any of the evening classes in which there is accommodation should any day student desire to attend.

A deposit of \$15 will be required to cover the cost of breakage in the chemical laboratory, the unexpended balance to be returned to the student at the end of the year.

The fees for the evening classes vary and are indicated elsewhere.

Fees are strictly payable in advance, and no student will be admitted to the classes until his fees are paid and he has filed an attendance card.



ENGINEERING CLASS ROOM



## Examinations

Examinations will be held at the end of each term.

Students who do not show sufficiently satisfactory progress in the final examinations at the end of the first year will not be admitted to the second year classes, and the same applies to second year students with reference to their admission to the third year classes.

Intermediate examinations will be held, which will serve to inform the student as to progress made, or lack of it, and may be appointed at any time.

In general, the examinations will cover the work of the preceding term, but at the end of the third year, candidates for diplomas may be examined on all preceding work.

Daily work and regularity of attendance will also be considered in making up the reports of standing.

## Reports of Standing

Twice during each term informal reports are sent to students, or to guardians of such as are not of age ; and at the end of each term formal reports are made.

## Attendance Card

At the beginning of each term all students must fill out and file with the Principal on blank forms which are provided, a formal application for such subjects as he may choose, subject to the approval of the Principal. When an attendance card is once approved, no change can be made except through the Principal.

## Thesis

All candidates for the diploma of the school must file with the Principal not later than May 15, a report of original investigation, or research, written on a good quality of paper, 8x10 inches, with one inch margin at left, and  $\frac{1}{2}$  inch at right of each page ; such thesis to have been previously approved by the head of the department in which it is made.



## Graduate Course

Graduates of technical courses of other schools are invited to communicate with the Principal with reference to special courses in the textile studies. Previous training in the engineering branches will usually reduce materially the time necessary to complete either of the courses at this school. The advantages offered to such persons for special research work are unexcelled, and a most profitable course may be arranged.

## Diploma

The diploma of the School is awarded upon the satisfactory completion of either of the five regular courses, covering not less than three years, except where entrance is to advance standing. In such cases at least one year's residence will be required.

## Certificate

For the satisfactory completion of a three years' course in any special department, the certificate of the School will be awarded ; it is possible to complete such a course in less than three years, if the candidate be passed to advanced standing, but at least one year's attendance will be required.

## Payments

All payments should be made to Wm. W. Crosby, Principal. If by check, remittance from points outside of New England should be in Boston funds.

## Medal of Honor

The New England Cotton Manufacturers' Association offers annually a medal to that member of the graduating class who shall be selected by a committee of the Association as best fitted to receive it.

## Conduct

Day students will be expected to attend all lectures, classes and demonstrations of practical work, except when permission to be absent has been obtained from the Principal. In cases of sickness or other unavoidable absence, written explanation must be sent to the Principal.

Books will be prescribed for study and for entry of lecture notes and other exercises, and will be periodically examined by the lecturers. The care and accuracy with which these books are kept will be considered in determining standing.

Students are required to return to the proper place all instruments or apparatus used in experimental work and to leave all machinery and apparatus with which they may experiment clean and in working order. All breakages, accidents, or irregularities of any kind must be reported immediately to the head of the department, or instructor in charge.

In the cases of either day or evening students, irregular attendance, lack of punctuality, neglect of either school or home work, disorderly or ungentlemanly conduct or general insubordination, will be considered good and sufficient reason for the suspension of a student by the Principal, and for his subsequent removal from the School and forfeiture of all School privileges, if the President of the School so decides.

Apparatus used in the Dyeing or Chemical Laboratory will be provided by the School, but a deposit must be made by the student at the beginning of the term sufficient to cover its cost, and this deposit will be returned to him at the close of the term, subject to such deduction as will reimburse the School for broken or damaged articles.

## Library

The School Library is supplied with all the leading textile books and with works dealing with science, art or industries allied to the textile trades. The leading textile trade papers are kept on file.

## Sessions

The regular school sessions will be in general from 9 a. m. till 1 p. m., and from 2.15 to 5 p. m., except Saturdays, when the buildings will be closed in the afternoon.

A tabular view will designate the hours at which the various classes meet. This will be rigidly adhered to and the register will be marked for each lecture or demonstration.

## General

Students from a distance, requiring rooms and board in the city, may, if they desire it, select the same from a list which is kept at the School. The cost of rooms and board in a good district is from \$4 per week upwards.

All raw stock and yarn will be provided by the School, and all the productions of the School remain, or become, the property of the Trustees, except by special arrangement, but each student will be allowed to retain specimens of yarn or fabrics that he has produced, if mounted and tabulated as prescribed by the Principal, and facilities will be given for the preparation of a collection of such fabrics as are produced in the School, with all the instruction for their manufacture. It is understood that the Trustees may retain in the School such other specimens of student's work as the Principal may determine.

Prospective students who are desirous of arranging special courses by omitting a portion of one course and adding a portion of another, are invited to communicate with the Principal.

An additional entrance examination to suit the convenience of students from a distance (out of New England,) will be arranged.

Lock boxes will be provided for the use of students, sufficiently capacious to contain clothing, books and tools. A deposit of 25 cents will be required, which will be returned to the student upon the surrender of the locker key.

No books, instruments, or other property of the School will be loaned to the students, or allowed to be removed from the premises.

Facilities will be given for visits by day students to New England mills and works during the session.

## Materials

Students must purchase such tools, instruments, text books, and apparatus as may from time to time be recommended by the head of each department, and the cost of these for day students will be from \$10 to \$15, and for evening students from \$1 upwards, according to the subject studied.

## The Regular Courses

The title of each of the regular courses is an indication of the particular nature of the course, unless it be in the case of Course III. There is a considerable demand for a general textile course in which the whole subject may be treated broadly ; this course is organized with this particular object in view, although various options are offered, in which some one branch may be followed at length. Certain general studies are included in each course, in order that in specializing a too narrow view may be avoided.

## Special Courses

While it is always urged that regular courses be followed if possible, there is opportunity to make special arrangements to fit for particular positions, as for example :— yarn mill, weaving special fabrics, designing, etc., and owing to the large number of possibilities, those desiring such courses are invited to correspond with the Principal. See paragraph “Certificate,” p. 56.

## Awards

Gold Medal Paris Exposition, 1900, for general excellence. A special Medal Merchants and Manufacturers Exhibition, Boston, 1900. The Pan American Medal awarded to the School, 1901.

# Courses of Instruction

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## DAY CLASSES

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For details of the several subjects see subsequent pages, beginning with page 64

### FIRST YEAR — FIRST TERM.

*(Common to all courses.)*

Design Construction.	Cloth Construction.
Cloth Analysis.	Hand Looms.
Elements of Mechanism.	General Chemistry.
Mechanical Drawing.	Freehand Drawing.

Options :

German, Advanced Mathematics.

### Course I. — Cotton Manufacturing

#### FIRST YEAR — FIRST TERM.

*(Common to all courses, see above.)*

#### FIRST YEAR — SECOND TERM.

Cotton Fibre.	Cotton Manipulation.
Microscopic Examination of Fibre.	Cloth Construction.
Design Construction.	Hand Looms.
Cloth Analysis.	General Chemistry.
Elements of Mechanism.	Freehand Drawing.
Mechanical Drawing.	

Options :

German, Advanced Mathematics

SECOND YEAR — FIRST TERM.

Cotton Manipulation.	Applied Mechanics.
Machine Drawing.	Warp Preparation.
Textile Chemistry and Dyeing.	Weaving.
Designing.	Cloth Analysis.

SECOND YEAR — SECOND TERM.

Cotton Manipulation.	Applied Mechanics.
Machine Drawing.	Weaving.
Textile Chemistry and Dyeing.	Designing.
Cloth Analysis.	Electricity.

THIRD YEAR.

Cotton Manipulation.	Designing.
Weaving.	Mill Engineering.
Knitting Machinery.	Thesis.

**Course II. — Wool Manufacturing**

FIRST YEAR — FIRST TERM.

*(Common to all courses, see page 60.)*

FIRST YEAR — SECOND TERM.

Wool Fibre.	Woolen Spinning.
	Microscopic Examination of Fibres.
Design Construction.	Cloth Construction.
Cloth Analysis.	Hand Looms.
Elements of Mechanism.	General Chemistry.
Mechanical Drawing.	Freehand Drawing.

Options :

German, Advanced Mathematics.

SECOND YEAR — FIRST TERM.

Woolen Spinning.	Applied Mechanics.
Machine Drawing.	Warp Preparation.
Weaving.	Designing.
Textile Chemistry and Dyeing.	Cloth Analysis.



SECOND YEAR — SECOND TERM.

Worsted Spinning.	Applied Mechanics.
Machine Drawing.	Weaving.
Textile Chemistry and Dyeing.	Designing.
Cloth Analysis.	Electricity.

THIRD YEAR.

Wool Manipulation.	Designing.
Weaving.	Mill Engineering.
Knitting Machinery.	Thesis.

**Course III. — Designing.**

FIRST YEAR — FIRST TERM.

*(Common to all courses, see page 60.)*

FIRST YEAR — SECOND TERM.

Design Construction.	Cloth Construction.
Cloth Analysis.	Hand Looms.
Design Sketching.	Freehand Drawing.
Mechanical Drawing.	General Chemistry.

Elements of Mechanism.

Options :

Woolen and Worsted Spinning.	Cotton Spinning.
German, Advanced Mathematics.	

SECOND YEAR.

Design Construction.	Cloth Construction.
Cloth Analysis.	Hand Looms.
Decorative Art.	Design Sketching and Jacquard Work.
Textile Chemistry and Dyeing.	Weaving.
	Applied Mechanics.

Options :

Woolen and Worsted Spinning.	Cotton Spinning.
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THIRD YEAR.

Designing — Advanced Work.	Weaving.
Mill Engineering.	Thesis.

Options :

Woolen and Worsted Spinning.
Cotton Spinning.

## Course IV. — Chemistry and Dyeing.

FIRST YEAR — FIRST TERM.

*(Common to all courses, see page 60)*

FIRST YEAR — SECOND TERM.

General Chemistry.	Qualitative Analysis.
Stoichiometry.	Mechanical Drawing.
Elements of Mechanism.	Designing.
Cloth Analysis.	Hand Looms.
	German.

SECOND YEAR.

Textile Chemistry and Dyeing.	Advanced Inorganic Chemistry.
Chemical Philosophy.	Organic Chemistry.
Applied Mechanics.	Electricity.
	Options :
Designing.	Weaving.
	German.

THIRD YEAR.

Quantitative Analysis.	Industrial Chemistry.
	Advanced Textile Chemistry and Dyeing.
Dye Testing.	Microscopy.
	Thesis.
	Options :
Weaving.	Mill Engineering.

## Course V. — Weaving.

FIRST YEAR — FIRST TERM.

*(Common to all courses, see page 60.)*

FIRST YEAR — SECOND TERM.

Design Construction.	Cloth Construction.
Cloth Analysis.	Hand Looms.
Freehand Drawing.	Mechanical Drawing.
Elements of Mechanism.	General Chemistry.
	Options :
Woolen and Worsted Spinning.	Cotton Spinning.
	German, Advanced Mathematics.

SECOND YEAR.

Design Construction.	Cloth Construction.
Cloth Analysis.	Hand Looms.
Decorative Art.	Loom Construction.
Textile Chemistry and Dyeing.	Weaving.
Applied Mechanics.	
Options :	
Woolen and Worsted Spinning.	Cotton Spinning.

THIRD YEAR.

Quantitative Analysis.	Industrial Chemistry.
Advanced Textile Chemistry and Dyeing.	
Dye Testing.	Microscopy.
Thesis.	
Options :	
Weaving.	Mill Engineering.

## Cotton Spinning Department

FIRST YEAR.

COTTON.

Lecture Course :

- Ancient History.
- Structure of Fibres.
- Botanical Varieties.— Their classification and characteristics.
- Commercial Varieties, classification, characteristics and adaptatives.
- Methods of Cultivation.
- Ginning.— Roller and Saw Gins.
- Baling.— Various forms of Baling Presses and their products, characteristics of each.
- Mixing.— Per cent, grade, variety and color mixtures.

PICKING.

Construction and operation of various machines used in the Picking process, and calculations connected with same.

Bale Breaker, Automatic Feed, Opener, Breaker, Intermediate and Finisher Pickers.

Cleaning Trunks, Evener Motions, Beaters, Regulation of Air Drafts, etc.

## CARDING.

Principles of Carding.

Construction and operation of various forms of Cards.

Top Flat Cards.

Revolving Flat Cards.

Card Clothing, Grinding, Setting, Drafts, Speeds, and Production and Calculations connected therewith.

Principles of Waste Carding.

Defects in operation and in quality and amount of production of the foregoing machinery and remedies for those defects.

Practical illustrations of principles taught and analysis of product.

## SECOND YEAR.

### DRAWING.

Theory of Drawing.

Effect of Doublings.

Construction and operation of the Railway Head.

Evener Motions.

Stop Motions.

The Drawing Frame.—Varieties and Details of Construction.

Stop Motions.—Mechanical and Electric Rolls, Common and Metallic and peculiarities of each.

Roll Setting, Proportioning of Drafts, Condensing.

Operation, Adjustment and Care of Drawing Machinery.

Speeds, Drafts and Production and Calculations for each.

## ROVING PROCESSES.

The development of the Fly Frames.

Mechanical construction and operation of the Slubber.

Intermediate, Fine and Jack Fly Frames, and features of each.

Explanation of Differential Motions. Builder Motions, Reverse Motions.

The functions and development of the Cones.

Draft, Twist, Tension, Lay and Taper regulation and the effect of each and calculations for same.

The Reeling, Weighing and Numbering of Roving.

Space, Traverse, and length of machines of the several Roving Processes.

Defects in Adjustment, Operation and Product of Roving Machinery, and the remedy for those defects.

Practical operation of the machinery illustrative of instruction given.

## SPINNING.

Classification of Yarns in regard to material, varieties, uses, twist, etc.  
Reeling, Weighing and Numbering of single and ply Yarns.  
Comparison of Throstle, Ring and Mule Spinning.  
Construction and operation of Ring Spinning Frames.  
Twist.—Amounts for warp, filling, hosiery yarns and ply yarns.  
Hard and Soft. Regular and Reverse.  
Comparisons of single and double roving in Spinning.  
Consideration of Spinning Frame details. Spindles, Rings, Separators.  
Builders.—Warp Filling and Combination.  
Calculations for Speeds, Drafts, Twists and Production.

## THIRD YEAR.

### COMBING.

Consideration of the Combing operation and preparatory machines.  
Sliver Lap Machine.  
Ribbon Lapper.  
Comber.—Construction, Operation, Settings, Timings, Adjustment.  
Per cents of Noil.  
Calculations in regard to Drafts, Speeds and Production.  
Practical application of principles taught.

### MULE SPINNING.

The development of the Throstle, Spinning Jenney and Mule.  
Construction and operation of the Mule.  
Details of operation, Drawing, Twisting, Backing off, Winding, Re-engaging.  
Details of construction.—Builder Motion, Quadrant, Roller Motion, etc.  
Calculations in regard to Speeds, Draft, Twist, Drag and Production.

### ORGANIZATION.

Figuring of "Programmes" of Doublings and Drafts, throughout the entire yarn manufacturing process, for the production of different varieties and numbers of cotton yarns.

Calculations for Schedules of Machinery required for the production of different amounts of various Yarns.

The economic arrangement of Machinery.

Powers required for various Machines, etc.

Knitting.

Construction and operation of Web Machines, Rib Machines, Loopers, etc., in the production of plain hosiery.

List of machinery adapted for different purposes in Cotton Mill Work.

Layout of Machinery for different processes.

# Woolen and Worsted Spinning Department

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## WOOLEN SPINNING.

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### FIRST YEAR — SECOND TERM.

#### Lecture Course :

Animal and Vegetable Fibres.  
Discussion of the various kinds of Wool and their Spinning qualities.  
Wool Sorting.  
Manufacture and use of Shoddies, Mungoes, Extracts, Flocks and Noils.  
Wool Washing, including the construction and uses of Washing Machines and Hydro-Extractors, and materials used as Detergents.  
Carbonization, Wet and Dry Process.  
The Solvent Process for Cleaning Wool.  
Construction and uses of Dryers (Table and Artificial).  
Shrinkage of Wool in Washing.  
Construction and uses of the several kinds of Pickers, Burring and Garneting Machines.  
Picking, Mixing, Blending and Oiling.  
Kinds and quantities of Oil. Testing.  
Principles of Carding.  
Carding on the First Breaker, Second Breaker and Finisher.  
Condensers.—Single and Double Doffers, etc.  
Setting and uses of the various parts of the Card.  
The various kinds of Feed.—Hand, Bramwell, Apperly, Camelback, Torrance Balling Head and Creel, etc.  
Card Clothing.—Various kinds of Backing (Leather, Linen, Flexifort, etc). Kinds and sizes of Wire; Garnet Wire.  
Method of counting Card Clothing (counts and crowns).  
Setting up Cards, turning up Cylinders, clothing the Card, Grinding.  
Speeds, Production, etc.

### SECOND YEAR.—FIRST TERM.

Principles of Spinning. History and development.  
Hand Jack, Self-operating and Self-acting Mules. The Mule-head.  
Method of driving the various parts, Rolls, Spindles, Carriage, etc.  
Backing-off. Winding Mechanism.  
Study of the Quadrant and Builder-rail. Regulation of the Fullers.  
Double Spinning. Twisting on Mule and on Woolen Twister.  
With the above lectures be given all the necessary calculations and actual practice on the various machines.



## WORSTED SPINNING.

### SECOND YEAR.—SECOND TERM.

#### Lecture course :

The difference between a Worsted and a Woolen Thread.  
Carding. Preparing.  
What wools are prepared and why they are not Carded.  
Doubling and Back Washing,—the nature of these processes.  
The principles, history and development of Combing.  
Combing on the Noble, Lister, Holden and Little & Eastwood Machines.  
Pin Setting. Gilling and Top Making.  
The hygroscopic property of Wool. Conditioning of Tops.  
Principles of Drawing.  
Construction of the Drawing and Roving Frames.  
Drawing on the Open, Cone and French Systems.  
Study of the Drag. Stop Motions.  
Construction and uses of Gauge Points.  
Principles of Spinning.  
Spinning on the Cap, Flyer and Ring Frames. Worsted Mule Spinning.  
Types of Frames ( Leicester and Illingworth ).  
Spinning of Carpet, Braid and Botany yarns.  
The system of counting Worsted yarns.  
Doubling and Twisting, including the construction and uses of the various kinds of Twisters.  
Winding, Hanking, Balling and Bundling. Yarn Testing, etc.  
The above lectures include all the necessary calculations and actual practice on the various machines.

### THIRD YEAR.

Manufacture of fancy yarns.	Fancy mixed yarns.
Woolen and Cotton.	Woolen and Silk.
Woolen and Worsted.	Union yarns, (Worsted and Cotton).
Two, three and more ply, fancy twists.	Fancy knotted yarns, Knickerbocker, etc.
Loop, Slub and Mottled yarns.	Layout of machinery for different processes.
Color as applied to fancy yarns.	
Humidifying and Humidifiers.	
Production and Costs.	

# Designing Department.

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## GENERAL COURSE.

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### FIRST YEAR.

1. Course of Lectures on cloth construction and designing in Cotton, Woolen, Worsted, Silk, Linen, etc.

Classifications of fabrics.

Plain fabrics and fabrics on a plain cloth basis.

Names and explanations of different parts of cloth and terms applied to weaves, etc. Point or design paper.

Methods of representing weaves, drafts,      Explanation of harness and chain  
etc., on paper.      drafts.

Twill cloth and combination of same.      Broken twills.

Sateens.      Combination of weaves.

Figured weaving on plain ground.      Diapers, coatings, trouserings.

Colored goods, stripes.      Checked goods.

2. Practical work and lessons on cloth analysis and reproduction of fabrics, one on planning patterns, drafts, etc., on paper, including yarn and cloth calculations, as below.

3. Practical work on hand looms, putting into operation the principles taught in the foregoing course.

Yarn and cloth calculations.

4. The uses of textile calculations, methods of naming or counting.

International System of counting yarns.

Comparative calculations for converting one system of yarns into that of another.

Calculations for folded or ply yarns.

Calculations to find weight, count or length of warp, from given data.

Calculations for reeds.

Calculations for harness, straight, centered, or pointed draft.

Calculations for harness, spaced and in combinations.

Calculations for shrinkage, or contraction.

Calculations for quantities of material to make plain and striped warps.

Calculations for quantities of material required to make plain and checked fabrics.

Calculation to find the number of ends per inch in order to use a given weight of warp, also picks per inch to use a given weight of filling.

Calculations on the proportioning of fabrics.

Practical lessons in color effects.

Combinations of colored threads.

Color definition.

Color nomenclature.

## SECOND YEAR.

### Lecture Course :

Construction of Cloth.	Balance of cloth.
Cloth made with or ornamented by extra warp.	Cloth made with or ornamented by extra filling.
Double and Triple Cloths.	Cotton, Fancy Sateen Stripes.
Cotton Velvets.	Cotton Plushes.
Cotton Pile fabrics, cut and uncut.	Color and color effects.
Color definition.	Color nomenclature.
Fancy Woolen Cassimeres.	Trouserings, Suitings and Coatings.
Figured Matellasses.	Worsted and Mohair Mantle Cloths.
Figured Blankets.	Carriage Robes.
Shawls.	Figured double Plain.

### Reversibles.

Practical Work and lessons on cloth analysis and reproduction of fabrics, and on planning patterns, drafts, chains, etc., on paper, including all necessary calculations.

Amount of material required for laying out lots for mixes and twisted yarns.

Amount of material used in the construction of fabrics, analysis to consist of Cotton Dress Goods, Gingham and Fancy Weave Dress Goods.

Fancy Woolen and Worsted Cassimeres.

Woolen and Worsted Suitings.

Woolen and Worsted Tricots.

Overcoatings.

Double Cloth and Ingrain Carpets.

Practical work on hand looms, putting into operation the principles taught in the foregoing course.

## THIRD YEAR.

### Lecture course :

Cotton Gauze.	Cotton Leno.
Cotton Lappet.	Jacquard Designing.
Casting out.	Distribution of Patterns.
Determination of areas occupied by the figures.	
Jacquard figures formed with warp.	Jacquard figures with filling.
Figures not square.	
The principles of designing, cloth structure and coloring and coloring best adapted to each of the above fabrics.	
Cloth formed by the combination of Jacquard gauze and fancy harness weaves.	
Jacquard pile and ordinary weaves.	Special designs for Jacquard gauze, and pile fabrics.
Vestings, Golfings, Lappet.	

### Analysis.

The Structure and analysis of all descriptions of compound fabrics, viz : — backed, double, and various types of Jacquard figured fabrics, especially applicable to the Cotton and Worsted industries.

Calculations necessary in determining the departmental and total cost of production of any fabric from given data of values of materials, labor, etc., by ascertaining the fibre, counts, threads, picks, weight, etc.  
Hand and power loom practice, putting into operation the principles taught in the foregoing course.

## Finishing

Examination of cloth from the loom, Perching, Knotting, Burling, Mending, etc.  
Preparation of cloth for the Fulling Mill.  
Flocking and its purpose.  
Construction and use of the Soaping Machine.  
Use of soaps and alkalies for fulling and scouring purposes.  
Construction and use of various types of Fulling Mills and Stocks.  
Theory and method of fulling various classes of goods.  
Construction and use of various types of Washing Machines.  
Theory and method of scouring cloth before and after fulling.  
Cloth Carbonization.  
Hydro Extractors and their use.  
Construction and use of various types of Napping Machines.  
Construction of various types of Gigs.  
Theory of Crabbing.  
Construction and use of various Starching and Water Proofing apparatus.  
Construction and use of various types of Tenting and Drying Machines.  
Construction of Single and Double Shears.  
Grinding and Setting Shears.  
Construction and use of the Steam Brush.  
Construction and use of Plate and Roller Presses.  
Method of finishing various classes of Woolen and Worsted goods.  
Cloth Examining, Measuring, Weighing, Ticketing, Numbering, Rolling, Baling, Casing and Shipping.  
Construction and use of the various machines necessary for this purpose, Testing apparatus, etc.  
All the necessary calculations for the various processes of finishing all classes of goods.

## Chemistry and Dyeing Department

The regular course in Chemistry and Dyeing for day students extends through three entire school years, and is especially recommended to those who intend to enter any branch of textile coloring, bleaching, or the manufacture or sale of the various dyestuffs and chemicals used in the textile industry.

In addition to acquiring a thorough knowledge of the principles of all branches of dyeing, printing, bleaching, etc., the student by application, study, and conscientious performance of all the prescribed laboratory and practical work, should become efficient in the subject of Textile Chemistry, and the methods of testing the various dyestuffs, mordants, etc.

In this course the following subjects are presented :

### GENERAL CHEMISTRY.

This subject is required of all students taking the regular course in Chemistry and Dyeing and all others intending to take up the study of Textile Chemistry and Dyeing later.

It will include lectures, recitations, and a large amount of individual laboratory work upon the following subjects, and will extend through one entire school year : —

#### *Chemical Philosophy.*

Chemical action, chemical combination, combining weights, atomic weights, chemical equations, acids, bases, salts, Avogadro's law, molecular weights, formulas, valence, periodic law, etc.

#### *Non-Metallic Elements.*

Study of their occurrence, properties, metallurgy, chemical compounds, etc.

#### *Metallic Elements.*

Study of their occurrence, properties, metallurgy, chemical compounds, etc.

#### *The Hydrocarbons and their derivatives.*

Study of their occurrence, properties, preparation, uses, etc.

#### *Qualitative Analysis.*

Before the completion of the course, the students will take up as thoroughly as the time will permit, the qualitative detection of the more common metals and non-metals, with practical work.

### QUALITATIVE ANALYSIS.

Qualitative Analysis will be studied by all regular students during the second term of the first year. The work will be based upon A. A. Noyes' Qualitative Chemical Analysis and will consist of one lecture, one recitation, and not less than five hours laboratory work per week. The student must become familiar with the separations and the detections of the common metals and acids by the analysis of a satisfactory number of solutions, salts, alloys, pigments, etc. At intervals during the term, short laboratory tests will be given as well as the regular written examinations.

No pains will be spared to make the course as valuable to the student as possible and to encourage only thorough and intelligent work.

Students taking Course IV will be required to work in the laboratory not less than twelve hours per week and when sufficiently advanced, will take up the examination of various products with which the textile chemist must be familiar, such as testing mordanted cloths, pigments, and the various dyeing reagents.

### STOICHIOMETRY.

This subject will be taken up by the chemistry and dyeing students during the second half of the first year.

The course will include a brief study of hydrostatics and the different methods of finding the specific quantities of solids and liquids. The application of the metric system will be thoroughly taken up, and problems will be worked by the students involving the expansion and contraction of gases, determination of empirical formulae, quantitative analysis, etc.

### TEXTILE CHEMISTRY AND DYEING.

Under this head is included first the lecture course in Textile Chemistry and Dyeing, which is taken by all regular diploma students, and second the laboratory and practical work course which will be taken by the regular Chemistry and Dyeing or Course IV students.

### OUTLINE OF LECTURE COURSE.

#### *Technology of Vegetable Fibers.*

Cotton, Linen, Jute, Hemp, China grass, etc. Chemical and physical properties, chemical composition, microscopical study, action of chemicals, acids, alkalies, heat, etc.

#### *Technology of Animal Fibres.*

Wool, Silk, etc. Chemical and physical properties, chemical composition, microscopical study, action of chemicals, acids, alkalies, heat, etc.

#### *Operations Preliminary to Dyeing.*

Bleaching of cotton and linen, wool scouring, bleaching, fulling and felting, silk scouring and bleaching, action of soaps.

#### *Water and its Application in the Textile Industry.*

Impurities present, the methods of their detection, their effect during different operations, and methods for their removal or correction.



*Mordants and other Chemical Compounds used in textile coloring not classified as dyestuffs.*

Theory of mordants, their chemical properties and their application, aluminum mordants, iron mordants, tin mordants, chromium mordants organic mordants, tannin materials, sulphated oil, fixing agents, leveling agents, assistants, etc.

*Theory of Dyeing.*

Chemical, mechanical, solution, etc.

*Natural Coloring Matters.*

Origin, properties, application of indigo, log-wood, catechu or cutch, Brazil wood, cochineal, fustic, tumeric, madder, quercitron bark, Persian berries, etc.

*Artificial Coloring Matter.*

General discussion of their history, nature, source, methods of manufacture, methods of classification, and their application to all fibres.

Special study of:—

Direct Cotton Colors.

Basic Coloring Matters.

Acid Dyestuffs.

Phthalic Anhydride Colors, including the eosins, rhodamines, phloxines, etc.

Alizarine Colors, including other artificial coloring matters requiring a metallic mordant.

Insoluble Azo Colors, developed on the fibre.

Sulphur Colors.

Aniline Black, artificial indigo, and other artificial dyestuffs not coming under the above heads.

*Machinery Used in Dyeing.*

A certain amount of time will be devoted to the description of the machinery used in the various processes of textile coloring and this will be supplemented as far as possible by the use of charts, diagrams, lantern slides, etc.

OUTLINE OF LABORATORY AND PRACTICAL WORK.

Besides lectures and recitations upon this subject, those taking the regular day course in Chemistry and Dyeing will be required to do at least fifteen hours per week of practical laboratory work. By the performance of careful and systematic experiments the student will learn the nature of the various dyestuffs and mordants, their coloring properties, their action under various circumstances and the conditions under which they give the best results. The more representative dyestuffs of each class will be applied to cotton, wool

and silk, and each student will be obliged to enter in an especially arranged sample book, a specimen of each of his dye trials with full particulars as to conditions of experiment, percentage of compounds used, time, temperature of dye bath, etc.

For convenience and economy most of the dye trials will be made upon small skeins or swatches of the required material, but from time to time students will be required to dye larger quantities.

By the use of a small printing machine the principles of calico printing, and with the introduction of dyeing machines, vats, etc., the practical side of the subject will be studied, and it will be the constant endeavor of those in charge, to impart such information of a theoretical and scientific character as is usually difficult to obtain in a dyehouse.

### CHEMICAL PHILOSOPHY.

This will be a continuation of the Stoichiometry of the first year.

It will include the principles of calorimetry, specific heat, vapor density, the various methods of determining molecular weights, laws of solution, electrolytic dissociation, theories of precipitation, etc. The student will be required to work out a large number of problems introduced by the subject.

### ADVANCED INORGANIC CHEMISTRY.

The whole subject of inorganic chemistry will be reviewed during the second half the second year, and many advanced topics will be introduced which were necessarily omitted from the first year course in General Chemistry.

### ORGANIC CHEMISTRY.

This subject, which was introduced during the latter part of first year general chemistry, will be continued during the whole of the second year as a special subject. The study will be taken up in a thorough manner and by the end of the year the student will understand the composition of the important artificial dyestuffs and the equations representing the reactions involved in their manufacture.

It will include lectures, recitations and laboratory work.

### INDUSTRIAL CHEMISTRY.

This subject will be taken up during the third year, particular attention being paid to those branches which are of special interest to the textile chemist, as oils, soaps, the gas and coal tar industry, building materials, and the manufacture of the important chemical compounds, acids, alkalies, bleaching powder, various mordants, etc., on a large scale.

The course will be illustrated as far as possible with the experiments, specimens, diagrams, and charts, and the students will be given an opportunity to visit some of the industrial establishments in the vicinity of Lowell and Boston.

#### ADVANCED TEXTILE CHEMISTRY AND DYEING.

This will be a continuation of the Textile Chemistry and Dyeing of the second year, and will include a review of the second year's work, with the introduction of many advanced subjects; such as dye testing calico printing, comparative dye trials, and numerous problems that arise in the dye house.

The course will include a large amount of work in the dyeing laboratory and will be supplemented by trips to a number of the large dye houses and print works in the vicinity.

#### MICROSCOPY.

The value of the microscope in the detection and examination of the various fibers cannot be over estimated, and often facts may be discovered, and conclusions drawn, which could be arrived at in no other way.

The students in this course will be given as much work with the microscope as time will permit. They will receive instructions in the use of the best microscopes made, and will not only have practice in the examination and detection of the fibers but will be required to become proficient in the preparation of permanent slides.

#### QUANTITATIVE ANALYSIS

This subject is taken up by all regular Chemistry and Dyeing students, and extends through the second and third years of the course.

During the second year, the principles of analytical work are thoroughly taught, the work being based on Talbot's Quantitative Chemical Analysis. Gravimetric analysis is studied during the first term, and volumetric analysis during the second term. The samples analyzed include salts, ores, minerals, bleaching powder, and alkalies. Frequent recitations are held for the discussion of methods and the solution of stoichiometrical problems. Students are encouraged to read the standard works and magazines on chemical subjects, in order to cultivate broad views of the science.

The third year work involves the analyses of water, alum, ammonia, soaps, coal, oils, indigo, tannin, and the ultimate analyses of organic compounds, as well as the examination of such substances as starches, gums, and other thickeners, detection of adulterants, etc.

No pains will be spared to give the students the benefits of all the latest researches along the lines of industrial analytical methods, and original work is encouraged in all.

## THESIS

Upon completion of this course, each student is required to present a thesis and do a certain amount of original work on some subject appropriate to this department. When this thesis has been approved by the head of the department, and accepted by the Principal, and examinations successfully passed in all required subjects, the student will be entitled to the regular school diploma.

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## Weaving Department

### SECOND YEAR

The process of making pattern warps.

The construction and use of Spooling and Quilling Machinery for wool and cotton.

The construction and use of Warpers of various kinds.

Long and short chain systems of preparing warps and filling.

Sizing materials and size mixing machinery.

The Woolen Sizing Machine.      The Woolen Beamer.

Drawing-in and Twisting.

Operation of machines named above, and warp preparation in cotton, woolen and worsted, silk and linen, timed to correspond with the respective lecture.

The plain power loom and its construction.

Shedding by cams.      Variety of cams for different grades

Various pickers and picking      of work.

                 motions      Principles of Beating-up motion.

Force of lay.      Adjusting lag to various grades

Take up and let-off motions.      of cloth.

Minor adjustments of the power loom.

Plain looms as altered for weaving fancy cloth.

Looms constructed for several shuttles.

Drop box motions.

Different makes of box motions, applied to gingham weaving.

Chain building for box looms.      Automatic looms.

Shuttle changing looms.      Filling Changing Looms.

### THIRD YEAR

Shedding motions      Single acting dobbies.

Double acting dobbies      Spring boxes and other motions for

Chain building for dobbies.      returning harness.

Fan reeds      Oscillating reeds.

Handkerchief motions	Lappet motions.
Leno weaving	Various shaker motions.
Centre selvedge motions.	Towel and other pile cloth weaving.

Practical work on the above looms, including teaching the student to weave, and fix looms.

Also pulling down looms and rebuilding same, including timing and setting. This work will be arranged to correspond with the respective lectures.

Open and close shed looms, for weaving various grades of woolen and worsted cloths.

Equal and unequal gear driven looms.

Lectures on Jacquard machinery.

Single lift Jacquards.                      Double lift Jacquards.

Leno Jacquards.

Jacquards specially arranged for ingrain carpet work.

Tying up Jacquard harness.

Tapestry weaving, quilt weaving, etc.

Weave room engineering and equipment.

Cost of weave mill operation and statistics of operation.

## Department of Engineering

### MECHANICS

#### FIRST YEAR—FIRST TERM

Elements of Mechanism.	Levers.
Force and Work, Measurement of	Theory and Design.
Screw.	Cams.
Worm and Wheel	Wipers.
Pulley Blocks.	Toggle Joints.
Inclined Plane and Wedge.	Quick Return Motions.
Rolling Cylinders and Cones.	Harmonic Motions.
Gearing, Spur and Friction.	Wheels in Trains.
Flexible Connectors.	Mangle Wheels.
Belts.	Aggregate Combinations.
Cords.	Differential Pulleys.
Chains.	Epicyclic Train, Compounds.
Disc and Roller.	

#### SECOND TERM

Applied Mechanics.  
Strength of Materials.

In the above topics will be included as many problems as possible, dealing with the construction of and maintenance of mills, not with the purpose of educating mill engineers, but rather to familiarize the student with the means at hand and processes employed in erecting structures for manufacturing, that they may study their government advantageously.

## SECOND YEAR—FIRST TERM.

### Motive Powers :

Water.	Dynamometers.
Steam.	Measurement of power.
Gas.	Pressure and impulse wheels.
Electricity.	Turbines, in-flow, out-flow, upward and mixed.
Suction and draft tubes.	Water meters.
Flow of water, quantity and Power.	Governors.
Elements of Thermodynamics as applied to steam.	

### Steam Engine :

Simple, compound and triple expansion.	Plain slide valve.
Condensing engines.	Double ported, Corliss, and cam.
Use of exhaust steam for heating and dye-house purposes.	Coal consumption.

### Indicator :

Construction of and use in measuring power and setting valves.	
Practical use of indicator and computation of indicator diagrams.	
Governors, throttling and cut-off.	Economy and costs.

### Gas engine theory :

Throttling type.	Hit and miss type.
Heat units in gas.	Governing devices.

## THIRD YEAR.

Mill Construction.	Mill Ventilation.
“ Humidifying.	“ Warming.
“ Maintenance.	“ Fire Protection.

Several courses of lectures on allied subjects by outside lecturers will be added.

## MACHINE DRAWING.

### FIRST YEAR.

Care and use of instruments.	Geometrical Constructions.
Elements of Projections.	Isometric Drawings.
Working Drawings.	Blue Print Process.

### SECOND YEAR.

Practical sketching from machines, both for mechanism construction and detail, and assembly drawing.



# Electricity

SECOND YEAR — SECOND TERM.

## Frictional Electricity :

- |                                    |                                    |
|------------------------------------|------------------------------------|
| Electric Attraction and Repulsion. | Free and Bound Charges.            |
| Two kinds of Electrification.      | Conduction.                        |
| Electric Field.                    | Distribution of Charges on Bodies. |
| Electroscopes,                     | Effects of Points and Edges.       |
| Law of Inverse Squares.            | Electric Machines.                 |
| Unit Quantity of Electricity.      | Uses Condensers — Leyden Jar.      |
| Electrification by Influence.      | Other Sources of Electricity.      |
| Dielectric Power.                  | Pyro Animal Electricity.           |
| The Electrophorus.                 | Piezo Vegetable Electricity.       |

## Magnetism :

- |                        |                                  |
|------------------------|----------------------------------|
| Natural Magnets.       | Magnetic Units — Dimensions.     |
| Artificial Magnets.    | Weber — Oersted.                 |
| Saturation.            | Gauss — Gilbert.                 |
| Strength.              | Unit Strength of Pole.           |
| Magnetic Needle.       | Upon what the Lifting Power of a |
| Magnetic Substances.   | Magnet depends.                  |
| Magnetization of Iron. | Magnetic Field.                  |
| Residual Effects.      | Magnetic Potential.              |
| Permeability.          | Intensity of Field.              |
| Susceptibility.        | Laws of Magnetic Force.          |
| Magnetic Circuit.      | Theory of Magnetic Curves.       |

## Electrostatics :

- |                          |                                  |
|--------------------------|----------------------------------|
| Theory of Potential.     | Equipotential Surfaces           |
| First and Second Laws of | Lines of Force.                  |
| Electrostatics.          | Dielectric Capacity.             |
| Electrostatic Units.     | Specific Inductive Capacity.     |
| Capacity.                | Dielectric — Stress.             |
| Quantity.                | Capacities, Series and parallel. |
| Potential.               | Phenomena of Discharge.          |

## The Electric Current :

- |                                  |                                      |
|----------------------------------|--------------------------------------|
| Conditions necessary for Flow of | Kirchhoff's Laws.                    |
| Current.                         | Ohm's Law.                           |
| Direct and Alternating Currents. | Divided Circuits.                    |
| The Voltaic Cell.                | Ampere's Rule.                       |
| Electromotive Force.             | Maxwell's Rule.                      |
| Resistance.                      | Magnetic Action of the Current.      |
| Volt — Ampere — Ohm — Watt —     | Induction.                           |
| Kilowatt.                        | Cutting of Magnetic Lines by a wire. |

Electrolysis.  
Amalgamation of Zinc.  
Polarization and Remedies for it.  
Chemical Actions.  
Voltaic Cells.

Power of Circuit.  
Heat generated by Current.  
Law of Lenz.  
Induction Coil.

Electrical Measuring Instruments :

Electrometer — Electrostatic  
Voltmeter.  
Tangent Galvanometer.  
Wheatstone Bridge.  
Astatic Galvanometer.  
D'Arsanval Galvanometer.

The Weston Voltmeter.  
The Weston Ammeter.  
Ohmmeter.  
The Electrodynamometer.  
Watt Meters.  
The Thompson Recording  
Wattmeter.

The Dynamo :

Theory of the dynamo.  
Alternating Current Generators.  
Commutation.  
Direct Current Generators.  
Ring and Drum Armatures.  
Arc and Incandescent Dynamos,  
Types of

Series Shunt and Compound Ma-  
chines.  
Characteristics.  
Losses in the dynamo. Hysteresis.  
Eddy Currents—Heating—Friction.

The Motor :

Theory.  
Railway Motors.

Series and Shunt and Compound.

Lamps :

Incandescent, for series and parallel circuits.  
Arc Lamps—Differential and shunt.

Alternating Currents :

Simple Harmonic Wave — Sine Wave  
Phase relation between E. M. F.  
and Current.  
True and apparent Watts.  
Alternating Current Motors.  
Synchronous Motor.

Single Phase, Quarter Phase Cur-  
rents.  
Power Factor.  
Polyphase Currents.  
Rotating Field.  
Induction Motor.

Electrical Distribution :

Series and Parallel Distribution.  
Direct Current Distribution.  
Transformer.

Rotary Converters.  
Alternating Current Transmission.

### THIRD YEAR.

Experimental Work in Statical  
Electricity.

Magnetic Experiments.

Tests of Voltaic Cells.

Use of the Galvanometer.

Resistance Measurements.

Wheatstone Bridge.

Slide Wire Bridge.

Speed Counters.

Tests of Arc Lights.

Tests of Incandescent Lights.

Incandescent Light Photometry.

Test of Thompson Wattmeter.

Transformer Testing.

Voltmeter Calibration.

Ammeter Calibration.

Plotting Characteristics of Series,

Shunt and Compound Dynamos.

Dynamo Testing.

Motor Testing.

Use of the Motor as a Dynamometer.

Power Plant Test.

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## Decorative Art Department

As a knowledge of the principles of design decoration and color is necessary to the success of the textile industry, the Department of Decorative Art has been formed to fill this need and is included in the regular course.

It will include the following : —

The Theory of Color.

The value of color.

The relation of various colors and their effect upon each other.

Harmony, contrast, analogy.

This will also include the making of diagrams and color charts illustrating these principles, and the matching of colors.

The principles of Design.

The study of the elements, and characteristics of design.

The study of geometric conventional and naturalistic forms, and adaptation of these forms to the construction of design.

Diaper ornament, repeats and the principles of geometric basis for the same.

Lectures on Ornament.

In connection with the above; lectures are given on the History of Ornament and its bearing on modern art, illustrated by stereopticon and colored plates.

## **Decoration**

Special arrangements have been made to form classes in freehand drawing and decoration, for the purpose of giving the students general instruction in the theory and practice of decorative art, the instruction afterward to be devoted to the special branch the student desires to follow. The school will thus fulfil the object of preparing the student in practical designing in any of the branches of decorative art, with special regard to fabrics.

The class in decoration and design is for the purpose of teaching the principles that enter into every species of design and while it is intended especially for fabrics, Jacquard, damasks, carpets, table-cloths, etc., it is equally applicable to any branch of Decorative Art, and would include the designing of wall paper, book covers, silver, interior decoration, etc.

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## **Class in Drawing, Painting and Composition**

This class will be for the benefit of those wishing to become painters, decorators or illustrators.

In this class drawing, painting and composition will be taught, and later, should the size of the class warrant it, drawing from the model will be introduced.

This class will be modelled after the Julian Academy of Paris.

Professor George's long experience abroad and in years of teaching in Boston makes this an exceptional opportunity for the students wishing to avail themselves of it.

The classes will be in session Monday and Thursday from 9 to 12 and 2 to 4, and Saturday from 9 to 12.

## **Stenography and Typewriting**

As an incidental study in the Commercial Course, arrangements have been made for instruction in Stenography and Typewriting. In many cases where there is a demand from selling houses for clerks who are familiar with the more technical portions of the business, a greater facility for handling the work will be had, if the clerk is familiar with the above named branches. The course is optional, and a fee will, for the present be charged, depending upon the length of the course taken.

## **Languages**

A department of modern languages has been established at the School; students at the school are offered either of these courses free.

Others who may desire to avail themselves of these language courses, without taking other courses, may do so at a charge of \$8 for 20 lessons.

## **EVENING CLASSES**

The courses of instruction offered in the evening are identical with those of the day, with the exception that less time is devoted to the machine work, since, in most cases this is of small moment; ordinarily the handling of the machinery is a part familiar to most of the students through contact with it in the day time, and in such cases the explanations and calculations are of the greater importance. In some cases it is possible to pursue two courses together, but this depends always on the arrangement of the schedule for any particular year.

The evening courses are free to graduates of the Evening High and Drawing Schools, operatives of the mills and machine shops, and other residents of Lowell, to such numbers as may be accommodated in the order in which they are received.

The requirements for admission to the Evening Classes are similar to those for the day. Graduates of other schools, will be received on presentation of proper credentials; for all others, examinations will be held on Thursday, Sept. 24, at 7 P. M. at the School. The candidates must be familiar with the English language, and the principles of arithmetic; for the first part, a short composition must be written on a given theme, and a certain amount must be written from dictation, while in the latter will be included addition, decimals, fractions, percentage, ratio and proportion.

### **Subjects**

The list of subjects embraced in each course is similar to that of the day and may be found beginning at page 64.

### **Certificate**

With the honorable and satisfactory completion of either of the regular evening courses in any subject, the certificate of the School will be awarded.

#### **Course I, Cotton Spinning.—3 Years**

Fee for all except residents of Lowell, \$2.50 per term, \$5.00 per year. See page 64.

#### **Course II [A], Woolen Spinning.—1 Year**

#### **Course II [B], Worsted Spinning.—1 Years**

Fee for all except residents of Lowell, \$2.50 per term, \$5.00 per year. See pages 67 and 68.

#### **Course III, Designing.—3 Years**

Fee for all except residents of Lowell, \$2.50 per term, \$5.00 per year. See page 69.

#### **Course IV, Chemistry and Dyeing. — 4 Years**

Fee for all except residents of Lowell, \$2 50 per term, \$5.00 per year. A deposit of \$5 will be required from all who take this course, whether residents of Lowell, or not, to cover the cost of the laboratory breakages; at the end of the year any unexpended balance will be returned, or an extra charge made as the case may be. See page 63.

#### **Course V. [A], Warp Preparation. — 1 Term**

Fee for all except residents of Lowell, \$2.50. See page 63.

#### **Course V [B], Weaving. — 2 Years**

Fee for all except residents of Lowell, \$2.50 per term, \$5.00 per year.

NOTE :—To secure the diploma of the School in Course V, both A and B must be completed. Course V [A] may be taken with Course V [B], so that the whole may be completed in two years. See page 63.

#### **Course VI, Mechanical Engineering. — 2 Years**

Fee \$2.50 per term. Free to residents of Lowell. See page 78.

#### **General**

The schedule showing the arrangements of classes for each term will be announced at the opening of each term.



REFERENCE No.	YEAR	TERM	HOUR PER WEEK	PREPARA- TION	METHOD OF INSTRUCTION	INSTRUCTOR IN CHARGE	TAKEN BY
Arithmetic	1	Entrance					
English	2	"					
Geography	3	"					
Algebra	4	1	1 & 2	2		{ Perkins Obear	All regular
Geometry	5	(Given in connection with No. 12 for the present)					
Trigonometry	6	1	1	2	4	Perkins	All regular Special
Elements Mechanism	10	1	1, 2 & 4	3	4	{ Crosby Perkins George	All regular
F. H. Drawing	11	1	1	2	1, 2		All regular
Mechanical Drawing	12	1	1 & 2	6	1, 2		All regular
Applied Mechanics	13	2	1	2		{ Crosby 1, II, III, & V Perkins Obear	All regular All regular All regular
Machine Drawing	14	2	1 & 2	10, 12	Recit. Lab. Lecture		
Mechanism Drawing	15	2	2	4	Lab. Lecture		
Mill Engineering	16	3	1 & 2	1			
Electrical Engineering	17	2	2	10, 13, 14		Obear	All regular
"	18	3	1-2	2		Obear	
Design Construction	25	1	1 & 2	2			
Cloth Construction	26			1, 2			
Cloth Analysis	27	1	1 & 2	2			
Hand Looms	28	1	1 & 2	2			
Design Construction	29	2	1 & 2	1, 2			
Cloth Construction	30	2	1 & 2	25, 26		{ Umpleby 1, II, III, & V Ferguson	

REFERENCE No.	YEAR	TERM	HOURS PER WEEK	PREPARA- TION	METHOD OF INSTRUCTION	INSTRUCTOR IN CHARGE	TAKEN BY		
Cloth Analysis	31	2	1 & 2	27	Lecture	Umpleby Ferguson	I, II, III, V		
Hand Looms	32	2	1 & 2	26, 28	Recitation Lab.				
Design Construction	33	3 }	1 & 2	29, 30	Lecture				
Cloth Construction	34	3 }	1 & 2	31	Recitation				
Cloth Analysis	35	3	1 & 2	31	Lecture				
Hand Looms	36	3	1 & 2	30, 28	Recitation Lab.				
Design Construction	37	A course similar to 25-36 given in the afternoon for students taking Decorative Art.							
Cloth Construction	38								
Cloth Analysis	39								
Hand Looms	40								
General Chemistry	50	1	1 & 2	3	Lecture	Olney	All regular		
General Chemistry	51	1	1 & 2	6	Recitation	Olney Spencer Braman	" "		
Qualitative Analysis	52	1	2	8	Lab.	Spencer Braman	IV		
	53	1	2	2	Lecture	Spencer	IV		
Stoichiometry	54	2	2	2	Lecture	Spencer	IV		
Advanced Inorganic	55	2	1	2	Lecture	Spencer	IV		
Chem. Philosophy	56	2	1 & 2	2	Lecture	Olney	IV		
Organic Chemistry	57	2	1 & 2	3	Lecture	Olney	All regular		
Tex. Chemistry & Dyeing									

REFERENCE No.	YEAR	TERM	HOURS PER WEEK	PREPARA- TION	METHOD OF INSTRUCTION	INSTRUCTOR IN CHARGE	TAKEN BY
Tex. Chemistry & Dyeing	58	2	1 & 2	16	37-50-51	Lab.	Olney Moorhouse IV
Quantitative Analysis	59	2	1 & 2	2	56	Lab.	Braman IV
"	60	2	1 & 2	10	59	Lab.	Braman IV
Industrial Chem.	61	2	1	10	56	Lab.	Olney IV
Tex. Chemistry & Dyeing	62	3	1 & 2	15	57-58	Lab.	Spencer Olney IV
"	63	3	1 & 2	1	57-58	Lecture	Moorhouse IV
Industrial Chem.	64	3	1 & 2	1	61	Lecture	Olney IV
Quantitative Analysis	65	3	1 & 2	2	59-60	Lecture	Braman IV
"	66	3	1 & 2	16	59-60	Lab.	Braman IV
Microscopy	67	3	1 & 2	2	57-58	Lab.	Olney IV
Cotton Fibre	75	1	2	2	10-11-12	Lecture	Braman I
" Preparing & Carding	76	1	2	4	75-10-11-12	Lab.	I
" Drawing	77	2	1	4	75-76	Lecture	I
"	78	2	1	6	77	Lab.	I
" Ring Spinning	79	2	2	5	78	Lecture	I
"	80	2	2	6	79	Lab.	I
" Combing	81	3	1	4	80	Lecture	I
"	82	3	1	9	81	Lab.	I

Humphrey  
Smith

REFERENCE No.	YEAR	TERM	HOURS PER WEEK	PREPARA- TION	METHOD OF INSTRUCTION	INSTRUCTOR IN CHARGE	TAKEN BY
Cotton Mule Spinning	83	3	4	82	Lecture	Humphrey	I
"Spooling, Warping etc.	84	3	9	83	Lab.		I
Wool Fibre	90	1	6, 5	10-11-12	Lecture Recitation	Smith	
Woolen Carding	91	1	6, 10	90	Lab.		II
Woolen Spinning	92	2	11	91	Lecture	Baker	II
Worsted Carding	93	2	11, 5	90	Lab.	Stewart	II
Combing & Top Making	94	2	11, 10	93	Lab.	Emerson	II
Worsted Drawing	95	3	15	94	Lecture		II
Spinning & Twisting	96	3	1 & 2		Lab.		
Finishing	97	3	1 & 2		Lecture	Stewart	II
Plain Loom Constr'n	105	2	1	{ 33, 34, 50, 51, 92, 96, 96, 108 10-11-12 25-26-27-28	Lecture		All regular
Weaving	106	2	7	105	Lab.		"
Weaving	107	3	11	106	Lecture	W. Nelson	"
Weaving	108	3	11	107	Lab.	E. Nelson	I, II, III, V
					Lab.		I, II, III, V

REFERENCE No.	YEAR	TERM	HOURS PER WEEK	PREPARA- TION	METHOD OF INSTRUCTION	INSTRUCTOR IN CHARGE	TAKEN BY
Weaving Mechanism	2	1 & 2	11	105	Lecture	W. Nelson	V
"	3	1 & 2		109	Lecture	W. Nelson	V
F. H. Drawing	1	1 & 2	2	1, 2	Lab.		Special Art
Historic Ornament	1	1	10		Lecture	George	All regular
Design Color	1 & 2	1 & 2	13		Lab.	Woodies	III
Drawing	1 & 2	1 & 2	13		Lecture		Special Art
Painting	1 & 2	1 & 2	13	182	Lecture		III
Illustrating	1 & 2	1 & 2	13		Lab.		Special Art
Decoration	3	1 & 2	13				Special Art
& Design	3	1 & 2	13				Special Art
Historic Ornament	1	2		125			125-126-127
Color	1						

# Register of Day Students

1902-1903

## THIRD YEAR

NAME	COURSE	ADDRESS
BENNETT, E. H.	11	Lynn, Mass.
BLOOM, WILFRED N.	1V	Back Bay, Boston, "
CAMPBELL, ORISON S.	11	Ware, "
CHAMBERLIN, F. E.	I	Jamaica Plain, "
EMERSON, FRANK W.	11	Lawrence, "
EVANS, A. W.	111	Haverhill, "
EVANS, W. R.	111	" "
FERGUSON, ARTHUR F.	111	Roxbury, "
FULLER, GEORGE	I	Adams, "
GERRISH, WALTER	111	Lowell, "
HOLGATE, BEN	111	" "
HUTTON, CLARENCE	111	" "
MORRISON FRED C.	I	Dover, N. H.
NAJARIAN, GARABED	1V	Rowley, Mass.
RASCHE, WM. A.	111	New York City.
ROBINSON, WM. C.	111	Melrose Highlands, Mass.
ROSENTHALL, J. S.	11	Newton, "
SNELLING, FRED N.	11	Haverhill, "
SPIEGEL, EDWARD	11	New York City.
STEVENSON, MURRAY R.	111	Clinton, "
STEWART, WALTER L.	111	New York City.
STONE, F. G. A.	11	North Andover, Mass.

## SECOND YEAR

ABBOTT, EDWARD M.	11	Westford, Mass.
BALDWIN, FRED A.	11	Andover, "
CARR, CHARLES R.	11	Warren, R. I.
CLAPP, AUSTIN F.	11	Malden, Mass.
CLOGSTON, RAYMOND B.	1V	Bradford, "
CULVER, RALPH F.	1V	Ayer, "
CUTLER, B. W., JR.	111	West Somerville, "
CUTLER, CLARENCE L.	1V	Lowell, "
DEWEY, JAMES F.	11	Montpelier, Vt.
DONALD, ALBERT E.	11	Springfield, Mass.
GEANEY, JAMES H.	111	North Andover, "
HALSELL, E. R.	I	Meridian, Miss.
HANLEY, A. M.	111	Worcester, Mass.
HARRIMAN, JAMES P.	111	Mattapan, "
HORSFALL, GEORGE G.	11	Martinsburg, W. Va.
JONES, EVERETT A.	11	Franklin Falls, N. H.



NAME	COURSE.	ADDRESS
JURY, A. E.	IV	Malden, Mass.
LUCEY, EDMUND A.	II	Natick, "
MACPHERSON, W. A.	III	North Adams, "
McKENZIE, B. D.	IV	Carleton Hill, N. J.
O'HARA, WM. F.	IV	Chelmsford, Mass.
PAINE, H. D.	I	Wakefield, "
PARKER, E. N.	I	Lowell, "
PETTY, G. E.	I	Archdale, N. C.
PRESTON, ROBERT	I	Wakefield, Mass.
ROTHSCHILD, E. J.	I	New Orleans, La.
SERRAT, H. D.	I	Malden, Mass.
SMITH, RALSTON F.	I	New Hartford, Conn.
STEVENS, DEXTER	I	Malden, Mass.
TOOVEY, SIDNEY E.	II	Orleans, "
WEBB, FRANK H.	IV	Haverhill, "
WHITE, ROYAL P.	II	Lowell, "
WILSON, W. E. H.	I	" "

### FIRST YEAR

ACKROYD, JOHN F.	I	Lynn, Mass.
ADAMS, HENRY S.	I	Haverhill, "
ARUNDALE, HENRY B.	III	Lawrence, "
BARDEN, LEON R.	II	Woburn, "
BOYD, GEORGE A.	I	Oakdale, "
BRANIGAN, EDWARD B.	IV	Wakefield, "
BROOKS, JOSEPH H.	I	Haverhill, "
CAMERON, GEORGE W.	I	Tewksbury, "
CARR, GEORGE E.	I	Adams, "
CLEMENTS, ROBERT	III	North Andover, "
COLE, EDWARD E.	IV	Bradford, "
COLE, JAMES T.	III	Medford, "
CRAWFORD, R. R. JR.	I	Winston, N. C.
CURTIS, WM. L.	I	Roxbury, Mass.
DANFORTH, WALTER K.	I	Woburn, "
DILLON, JAMES H.	III	Belchertown, "
DONNELLAN, FRANK T.	III	Lowell, "
DUNCAN, ROBERT C.	IV	Woburn, "
HARRIS, CHARLES E.	I	Lowell, "
HOLLINGS, JAMES L.	I	Dorchester, "
HOOK, R. W.	IV	West Medford, "
HUNT, CHESTER L.	III	Lowell, "
JACKSON, WM. C.	IV	" "
LEE, WM. H.	II	Holyoke, "
LEWIS, WALTER S.	IV	North Woburn, "
LUCK, FRANK A.	I	Burlington, Vt.
MACBRAYNE, RALPH J.	III	Lowell, Mass.
MARRA, WM. J.	I	Holyoke, "
McCLEERY, WALTER L.	IV	Lowell, "
MCDONALD, JOSEPH S.	II	Bradford, "
McKENNA, HUGH F.	IV	Woburn, "
MEADOWS, WM. R.	I	Lowndesboro, Ala.
MIDWOOD, ARNOLD J.	IV	Lowell, Mass.
MOORE, EVERETT B.	I	Lynn, "
MORRIS, JAMES J.	II	Lowell, "

NAME	YEAR.	COURSE.	ADDRESS
O'DONNELL, JOHN D.		1	Holyoke, Mass.
PARADIS, LUCIEN A.		111	Lowell, "
PHANEUF, HORACE H.		11	Nashua, N. H.
PHIPPS, T. T.		1	Concord, Mass.
PRIOR, EVERETT L.		1	Malden, "
RODMAN, WALTER, JR.		11	LaFayette, R. I.
SHERWELL, WALTER N.		111	Lowell, Mass.
SHUMAN, WALDO I.		11	Boston, "
SHUMWAY, ALONZO H.		11	Tannton, "
SMITH, WM. M.		1	Somerville, "
THOMPSON, EVERETT L.		1	Woburn, "
WARREN, P. H.		11	Worcester, "
WIGHTMAN, WM. H.		1V	Lawrence, "

### SPECIAL STUDENTS

CAMPBELL, LOUISE P.	3	111b	Lowell, Mass.
CRAIG, CLARENCE E.	3	111	" "
DAY, HARRIET L.	1	111b	Boston, "
HUFF, GLENN C.	1	11	Kenosha, Wis.
HUMPHREY, GRACE L.	2	111b	Lowell, Mass.
JONES, CLARA E.	1	111b	Nashua, N. H.
KANE, JOHN W.	1	111	Lowell, Mass.
LINCOLN HARALD A.	1	Electricity	Brookline, "
MANCHESTER, C. E.	1	Electricity	Lowell, "
PEVEY, JOHN F.	1	111	" "
READER, LOUISE R.	2	111b	" "
REYNOLDS, ISABEL H.	3	111	North Andover, "
RILEY, THOMAS F.	2	111b	Lowell, "
ROBERTS, CARRY B.	2	111b	" "
SMOOT, MARY	1	111b	" "
SYLVESTER, ALICE	1	111b	" "
WALKER, ANNA G.	1	111b	" "

# Register of Evening Students

1902 - 1903

## POST GRADUATES

NAME	COURSE	ADDRESS
A. L. MOIR	III	Lowell, Mass.
DAVID WALKER	III	Collinsville, Mass.

## FOURTH YEAR

J. W. MYERS,	IV	Lowell, Mass.
B. I. STOKHAM,	IV	Lowell, Mass.

## THIRD YEAR

BALMFORTH, MARTHA	III	North Billerica, Mass.
BARRINGTON, J. A.	IV	Methuen, "
BARRY, E. J.	III	Lawrence, "
BASTOW, H.	III	Lawrence, "
BURNS, E. J.	IV	Lowell, "
BLINKHORN, R. F.	I	" "
BRIMIGION, C.	IV	" "
BURNS, J. E.	IV	" "
DEVINE, J. J.	IV	" "
FERNLEY, J. A.	I	" "
GAFFNEY, M. J.	I	" "
GARNER, W.	III	" "
GOODCHILD, G.	I	" "
HALSELL, E. R.	I	" "
HONIKER, J. J.	III	Lawrence, "
HOWARD, J.	III	Lowell, "
HUNTON, L. G.	IV	" "
JENNINGS, J. J.	III	" "
KNAPTON, S.	IV	" "
KNOWLES, F. E.	I	" "
LAWRENCE, C.	I	" "
MARTINSON, C. W.	III	North Billerica, "
MASON, F. A.	I	Lowell, "
NOONAN, D. T.	III	Lawrence, "
PALMER, G. B.	III	Lowell, "
PETTY, G. E.	III	" "
ROUSE, J. C.	IV	" "
SALISBURY, C. A.	III	Lawrence, "
SCARLOTT, G.	I	Lowell, "
SCHOFIELD, J. S.	III	Lawrence, "
STEVENSON, W.	V	North Billerica, "
STOKHAM, B. I.	IV	Lowell, "
TALFORD, E. D.	III	" "
TONGE, M.	III	Lawrence, "
UPTON, F. A.	I	Lowell, "
VARNEY, M. H.	I	" "

# SECOND YEAR

NAME	COURSE	ADDRESS
BALLOU, L. H.	III	Lawrence, "
BOWRING, G. P. B.	VI	Lowell, "
BYAM, W. S.	VI	" "
CADY, D. J.	V	Lawrence, "
CHIEETHAM, J. J.	I	Lowell, "
CLIFFORD, J. H.	IV	Lawrence, "
COLLIER, W. A.	V	Lowell, "
CONLON, P. F.	IV	" "
CROWLEY, E. J.	I	" "
DAKIN, J. K.	III	" "
DAVIS, P. F.	I	" "
DELMAGE, E. R.	III	" "
DIMLICK, B. C.	III	Lawrence, "
EVANS, W. R.	III	Lowell, "
EVANS, A. W.	III	" "
FIELD, C. W.	I	" "
FIFE, G.	VI	" "
FLYNN, J. J.	VI	Lowell, Mass.
FOLEY, M.	II	Lawrence, "
FRANK, E. M.	III	" "
FREEMAN, F. E.	II	" "
FRENCH, F. B.	II	" "
GALVIN, W. H.	VI	Lowell, "
GRAY, F.	VI	" "
HEDRICK, C. F.	I	" "
HOYLE, E.	II	" "
HUNTER, R.	V	West Medford, "
JENNINGS, J. J.	III	Lowell, "
JOHNSON, S. L.	V	Lawrence, "
KELLEY, A. L.	IV	Lowell, "
KELEHER, J.	II	Lawrence, "
KITCHING, J. M.	V	Lowell, "
LAKE, W. F.	III	Lawrence, "
LEACH, J. W.	V	" "
LIBBY, C. R.	VI	Lowell, "
LINCOURT, H.	VI	" "
LORD, H. D.	III	" "
McQUAID, A. J.	I	" "
MORGAN, W. B.	VI	" "
MOZLEY, A.	VI	Dracut, "
MUNRO, A. C.	III	Boston, "
NICHOLSON, R.	II	Lawrence, "
O'NEILL, P. F.	IV	" "
OSGOOD, C. F.	VI	Lowell, "
PAYSON, C. G.	I	Boston, "
PATRICK, A.	III	Lawrence, "
PHELPS, W. E.	I	Lowell, "
REDMAN, H. S.	III	" "
ROONEY, G. W.	I	" "
SHERLOCK, J.	III	" "
SMITH, W. H.	IV	" "
TONGE, J.	IV	Lawrence, "
TOSNEY, J. A.	II	" "
WALKER, H. L.	VI	Lowell, "
WHITAKER, F.	II	Lawrence, "
WRIGLEY, J. W.	II	Andover, "

# FIRST YEAR

NAME	COURSE	ADDRESS
ADAMS, E. W.	III	Boston, Mass.
ADAMS, M. E.	VI	Lowell, "
ADAMS, WM. R.	III	North Andover, "
AHERN, T. J.	VI	Lowell, "
ALISTER, JAMES,	III	" "
ARCHIBALD, E. F.	VI	" "
AYER, N. F.	III	Boston, "
BAGSHAW, A. H.	IV	Lowell, "
BAKE, HERBERT	III	Lawrence, "
BALMFORTH, J. H.	II	North Billerica, "
BALMFORTH, W. F.	VI	" " "
BARKER, J.	V	Lowell, "
BARRINGTON, J. L.	III	North Billerica, "
BARRIS, G. W.	VI	Lowell, "
BAXTER, A. I.	IIA	" "
BEATTY, J. J.	VI	" "
BEVERLEY, J.	V	Lawrence, "
BILODEAU, T. H.,	VB	" "
BIXBY, R.	VI	Lowell, Mass.
BIXBY, G.	V	" "
BLINKHORN, E. J.	IV	" "
BOCK, A. E.	VI	" "
BOUCHER, J. L.	VI	" "
BOWEN, G. A.	VI	" "
BOWKER, A. B.	I	Lawrence, "
BOWEN, PATRICK	VI	Lowell, "
BRADY, AGNES	III	" "
BRADLEY, W. A.	V	" "
BROWN, H. H. C.	IV-III	North Billerica, "
BRIMIGION, C.	IV	Lowell, "
BROWN, J. P.	III	" "
BURBY, T. L.	I	Lawrence, "
BURNS, J. J.	IIA	Lowell, "
BURNS, M. J.	VI	" "
BURGHARDT, P. C.	III	Dracut, "
BURLEIGH, D. P.	V	Lowell, "
BUTLER, R. D.	VI	Pelham, N. H.
BUTLER, B. O.	VI	Lowell, Mass.
BUTTERFIELD, L. H.	V	" "
CADDELL, D. R.	VI	" "
CALLAHAN, P. A.	VI	Lawrence, "
CAMPBELL, C.	V	Lowell, "
CAMPBELL, F.	VI	" "
CARON, CLEOPHAS	I	Lawrence, "
CARR, H. R.	III	Lowell, "
CARROLL, F. C.	IV	" "
CASEY, WM. J.	II	" "
CASSIDY, J. H.	V	" "
CASSIN, W.	II	" "
CHARLES, W. G.	III	" "
CHOATE, A. J. R.	I	" "
CHRISTIAN, D. E.	VI	" "
CHURCH, C. R.	II	" "

NAME	COURSE	ADDRESS
CILLEY, O. H.	III	Lowell, Mass.
CLIFFORD, L. J.	IIIa	" "
COBURN, ELMER R.	IV	Methuen, "
COGGESHALL, W. L.	VI	Lowell, "
COLE, H. C.	I	" "
COLLINS, J. L.	III	" "
CONLEY, F. A.	VI	" "
CONLEY, J. F.	VI	" "
CONNELLY, G.	V	" "
CONNORS, E. F.	VI	" "
CONNORS, J. F.	VI	" "
COOKSON, CARL	VI	Lawrence, "
CORCORAN, J. M.	IV	Lowell, "
COUGHLIN, W. M.	III	" "
COX, E. F.	VI	" "
CROWLEY, J.	I	" "
CUSHING, W. L.	I	" "
CURRAN, C. G.	II	" "
DANFORTH, L. B.	VI	North Andover, "
DAVIS, WM.	III	Lowell, "
DEFOE, C. J.	VI	" "
DELCHANTY, M. C.	V	" "
DESMARAIS, A. J.	VI	" "
DEVINE, F.	IIIa	" "
DICK, H.	III	Lawrence, "
DONALD, GEORGE	IV	Lowell, "
DONNELLY, P. J.	III	" "
DONAHUE, F. J.	VI	" "
DONAHUE, M. F.	VI	" "
DOLAN, L. E.	VI	" "
DOOLEY, E. W.	VI	" "
DOOLE, G. L.	VI	" "
DOW, G. L.	VI	" "
DOWNNEY, W. J.	II	Lawrence, "
DOUGLAS, R.	VIa	Lowell, "
DRIVER, J. T.	II	" "
DUDLEY, G. E.	III	" "
DUFFY, W. J.	IV	" "
DUGGAN, F. P.	VI	" "
EDWARDS, J. R.	IV	" "
EGAN, KATHERINE	III	" "
EVISON, W. A.	V	" "
EYERS, J.	IV	" "
FAGAN, F. W.	VI	" "
FARNSWORTH, A.	VI	Lawrence, "
FARRELL, O.	V	Lowell, "
FIRTH, CHAS. H.	IIIa	Methuen, "
FLEMING, F. E.	IV	Tewksbury, "
FLETCHER, M. J.	V	Lowell, "
FLINT, G. H.	II	Andover, "
FORD, WM. B.	V	Melrose Highlands, "
FOSTER, S. S.	I	Lowell, "
FRENCH, E. J.	I	Lawrence, "
GAFFNEY, J.	V	Lowell, "
GALLAGHER, T. H.	VI	" "



NAME	COURSE	ADDRESS
GALLAGHER, T.	vb	Lowell, Mass.
GANNON, E. J.	vi	" "
GAUNT, N. E.	11a	Methuen, "
GERRISH, W.	11	Lowell, "
GIBBONS, P.	11	" "
GILES, E. T.	vi	" "
GILL, W.	vi	Lawrence, "
GIRARD, G. E.	va	Lowell, "
GLEASON, F. T.	iv	Lowell, "
GLYNN, T. P.	v	" "
GOODCHILD, T.	iv	" "
GRAY, JOHN	111	" "
GREAVES, W. D.	v	" "
GREENE, B. C.	iv	" "
GREENE, R. H.	v	" "
GUARD, GEO. F.	11	Andover, "
GREENWOOD, ED.	111	Lawrence, "
HADLEY, WM. L.	vi	Lowell, "
HAGGERTY, J. M.	vi	" "
HAITHWAITE, J. D. B.	v	" "
HALL, I. S.	vi	" "
HALLIGAN, C.	11	" "
HANDS, L. P.	vi	" "
HANNAFIN, W. G.	vi	" "
HARMON, C. M.	vi	" "
HARTNETT, D.	11	" "
HARRIS, F. W.	v	" "
HAVEN, G. W.	111	Melrose Highlands, "
HEATH, J. T.	111	Lawrence, "
HEATHCOCK, W. R.	11b	Lowell, "
HEBERT, CHAS.	iv	" "
HEFFERMAN, W. A.	11	Lawrence, "
HEMPEL, F.	v	" "
HIGGINS, JAMES A.	11	North Billerica, "
HIGHAM, A. W.	vi	Lawrence, "
HIGSON, J.	111	North Billerica, "
HILL, F. A.	vi	Lowell, "
HILLIARD, W. B.	vi	" "
HINTZE, H. S.	vi	" "
HOESSLER, C.	v	" "
HOLGATE, B.	v	" "
HOLT, L.	i	" "
HOOLE, A. E.	iv	" "
HORAN, C. A.	v	" "
HOWARD, J. A.	v	" "
HOOLE, W. H.	iv	" "
HOUSTON, G. A.	111	" "
HOWARD, T.	v	" "
HOWE, A. T.	iv	" "
HOYLE, J.	11	" "
HUNKING, S. H.	vi	" "
HYDE, L. GERTRUDE	111	" "
JEANOTTE, A.	vi	" "
JOHNSON, C. W.	vi	" "
JOHNSON, E. A.	v	Lawrence, "

NAME	COURSE	ADDRESS
JOHNSON, F. E.	IV	Lawrence, Mass.
JOHNSON, W. E.	I	" "
JONES, E. G.	II	Lowell, "
JONES, R. E.	VI	Pelham, N. H.
JUDD, C. W.	IV	Lowell, Mass.
KELLY, T. F. J.	IV	" "
KENNEDY, M. F.	IIA	" "
KENNEDY, R. A.	III	" "
KENWORTHY, J.	I	" "
KERR, J. J.	III	" "
KERSHAW, W. E.	V	North Billerica, "
KIDD, T. E.	VI	Lowell, "
KIMBALL, C. P.	III	" "
KIMBALL, I. D.	I	" "
KNOWLTON, H. W.	VI	" "
LAHUE, G. M.	V	" "
LAMONT, W. M.	V	Andover, "
LANGVIN, F. D.	VI	Lowell, "
LANOUILLE, L. J.	VI	" "
LAUGHLIN, J. C.	IV	" "
LAW, A. P.	IV	" "
LECLAIR, J. E.	V	" "
LEBLANC, L.	VI	" "
LEITH, E. E.	V	" "
LEITH, J. E.	III	" "
LITTLEFIELD, A. C.	VI	" "
LORD, W.	IV	Lawrence, "
LORIGAN, J. T.	V	Lowell, "
LORIGAN, J. F.	V	" "
LOVETT, E. S.	VI	" "
LYNNESS, C.	V	" "
MacBRAYNE, R. J.	V	" "
MacDONALD, A. J.	V	" "
MacDONALD, M. G.	III	" "
MAGUIRE, J. H.	VI	" "
MANCHESTER, B. V.	III	" "
MANCHESTER, J. V.	III	" "
MARSHMAN, W. E.	II	Lawrence, "
MASON, R.	VI	" "
MATTHEWS, J.	VI	" "
McCARTHY, J. F.	III	" "
McDONALD, W.	V	Lowell, "
McDONALD, M.	V	" "
McELMON, W. M.	VI	" "
McGANN, M.	III	" "
McGANN, N.	III	" "
McGUIRK, J. J.	VI	" "
McHUGH, J. A.	V	" "
McMAHON, J. F.	III	" "
McMICHAEL, R. S.	v and VI	" "
McNAUGHTON, S. D.	VI	" "
McPHERSON, W. J.	V	" "
McQUADE, A. G.	VI	" "
McQUADE, H. B.	III	" "
MEADOWS, W. R.	II	" "

NAME	COURSE	ADDRESS
MERRILL, E. C.	V1	Lawrence, Mass.
MERTSH, O.	III	Dracut, "
MILLER, E. H.	V	Lawrence, "
MILLER, G. A.	IV	Lowell, "
MINAHAN, J. A.	III	" "
MOLLOY, A.	III	" "
MOLONEY, B.	IV	" "
MOLONEY, L. A.	V1	" "
MONAHAN, O. A.	IV	" "
MOODY, L. V.	III	" "
MOOREHOUSE, T.	V1	Lawrence, "
MOUNTAIN, W. E.	V1	Lowell, "
MURPHY, G. W.	V1	" "
MURPHY, J. H.	V1	" "
MURPHY, J. J.	I	" "
NAGLE, WM.	II	" "
NELSON, W. C.	III	Lawrence, "
NOBLE, J. T.	IV	Lowell, "
NOONAN, T. F.	III	" "
NOTMAN, F. W.	I	Jamaica Plain, "
O'BRIEN, D.	IV	Lowell, "
O'CONNORS, S.	III	" "
O'DAY, W. M.	V	Chelmsford Centre, "
O'DONNELL, J. D.	III	Lowell, "
OGDEN, W.	V	" "
O'HAGAN, B. J.	V	" "
O'ROURKE, J. J.	III	" "
OWENS, T. F.	I	" "
PARADIS, J. H.	III	" "
PEARSON, T. L.	IV	" "
PEEL, J.	III	Lawrence, "
PETERSON, A. J.	IV	Lowell, "
POTTER, J. E.	V1	" "
POTTER, R. W.	III	" "
PRATT, L. W.	V1	" "
PRESCOTT, E. H.	I	" "
QUIRKE, J.	V	" "
RAFTER, T. B.	IV	" "
REDHEAD, B.	V1	" "
REDHEAD, W. B.	V1	" "
REED, C.	I	Lowell, "
REED, F. C. K.	V1	Lawrence, "
RICE, J. A.	III	Lowell, "
RIORDAN, W. P.	V1	" "
RIPLEY, W. G.	IV	Malden, "
ROBITAILLE, F. M.	V1	Lowell, "
RHODES, J. E.	V	" "
RHODES, W. A.	III	" "
ROARKE, J. F.	V1	" "
ROBINSON, C. A.	V1	Methuen, "
ROBINSON, R. H.	III	Lowell, "
ROCKWELL, H. D.	II	North Andover, "
ROONEY, G. W.	I	Lowell, "
ROUSSEAU, W. G.	V	" "
ROY, E.	V1	" "

NAME	COURSE	ADDRESS
RYAN, J. J.	V	Lowell, Mass.
RYAN, R.	V	" "
SANBORN, F. W.	VI	" "
SARGENT, E. W.	III	Collinsville, "
SCANLON, T.	II	Lowell, "
SCHOLZ, F. W.	II	Lawrence, "
SCHOON, F.	II	" "
SCOTT, E.	III	Lowell, "
SENER, P. W.		" "
SHAW, J.	V	" "
SHORE, W. T.	VI	" "
SHYNE, J. J.	V	" "
SIMPSON, J. A.	I	" "
SKINNER, C. W.	III	Methuen, "
SKINNERS, M. F.	II	Lowell, "
SMITH, A.	III	Lawrence, "
SMITH, ED.	I	Lowell, "
SMITH, E.	V	" "
SMITH, G. A.	III	Methuen, "
SMITH, J. W.	II	Lawrence, "
SMITH, W. E.	VI	Lowell, "
SMITH, W. E.	III	Methuen, "
SOMERS, L. J.	VI	Lowell, "
SPAULDING, C. E.	VI	" "
STEARNS, A. W.	III	" "
STEARNS, W. A.	II	" "
STERLING, W.	III	" "
STILES, J. W.	VI	" "
STILLING, C. E.	VI	" "
STOPHERD, W. H.	III	" "
SULLIVAN, J. E.	VI	" "
SULLIVAN, T.	II	" "
TARPEY, J. F.	VI	" "
TAYLOR, C. L.	VI	" "
THOMAS, C. N.	VI	" "
THOMPSON, C. B.	VI	" "
THORNE, W. W.	VI	" "
TITUS, O. B.	VI	" "
TRUDEAU, J.	VI	" "
TUCKER, G. H. L.	VI	" "
TUNNEY, F. A.	VI	" "
TURNER, R. C.	I	" "
TYRRELL, R. J.	I	" "
TYRRELL, W. B.	VI	" "
TYRRELL, W.	VI	" "
VARNEY, M. H.	V	" "
VAUGHN, F. I.	III	" "
VOELKMER, H.	II	Lawrence, "
WAIN, M. A.	III	North Billerica, "
WALKER, A. C.	VI	Lowell, "
WALLWORK, C. M.	III	" "
WARD, J. J.	III	" "
WEATHERSTONE, R.	III	" "
WEBB, F. H.	V	" "
WEBSTER, J. J.	II	" "

NAME	COURSE	ADDRESS
WEISS, H.	IV	Lawrence, Mass.
WELCH, J. J.	IV	" "
WELCH, M. M.	IV	Lawrence, "
WELDON, W. A.	V	Lowell, "
WELLETTE, C. L.	VI	" "
WEST, J.	IV	" "
WHEELOCK, E. M.	VI	Lawrence, "
WHEELWRIGHT, D. P.	III	Lowell, "
WHITAKER, F.	II	Lawrence, "
WHITWORTH, A.	II	Lowell, "
WHOLEY, D. J.	VI	" "
WILD, E.	III	Methuen, "
WILKINSON, J. H.	V	Lawrence, "
WILLIAMS, CLARENCE	V	Lowell, "
WILSON, HARRY C.	VI	" "
WILSON, L. L.	I	" "
WING, O. A.	III	" "
WOLCOTT, R. F.	VI	" "
WOOD, H. M.	VI	" "
WOODCOCK, E. C.	III	" "
WORDEN, R. S.	VI	" "
YOUNG, C. S.	IV	" "

## SUMMARY

Day Students,	-	-	-	-	-	-	120
Evening Students,	-	-	-	-	-	-	446
Total,	-	-	-	-	-	-	566
Deduct names counted twice,	-	-	-	-	-	-	9
							537



## Class of 1903

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### Graduates With Titles of Theses

#### DAY CLASSES

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##### Diplomas awarded as follows:

- ARTHUR FEILING FERGUSON, I Roxbury, Mass.  
Relation of Amounts of Twist to Breaking Strength of Cotton Yarn.
- GEORGE FULLER, I Adams, Mass.  
Thesis with Frederick Ellery Chamberlin,  
Comparison of American Grown and Imported Egyptian Cotton.
- FRED CLIFTON MORRISON, I Dover, N. H.  
Thesis with George Edward Petty,  
Comparison of Effects of Metallic and Common Rolls  
on Long Staple Cotton.
- FREDERICK ELLERY CHAMBERLIN, I Jamaica Plain, Mass.  
Thesis with George Fuller
- JOHN SIGMUND ROSENTHAL, II Newton, Mass.  
Thesis with Orison S. Campbell,  
An Investigation of the Uniformity of Twist in Worsted Yarn  
Spun on Whirl with and without pegs.
- ORISON SARGENT CAMPBELL, II Ware, Mass.  
Thesis with John Sigmund Rosenthal.
- FRANK WARREN EMERSON, II Lawrence, Mass.  
Thesis with Fred Newman Snelling.  
An Investigation of the Ratio existing between Twist and Breaking  
Strength of Worsted Yarn.
- FRED NEWMAN SNELLING, II Haverhill, Mass.  
Thesis with Frank Warren Emerson.
- ALFRED WHITNEY EVANS, III Haverhill, Mass.  
Thesis with William Robinson Evans,  
Primitive Design and its Development.
- WILLIAM ROBINSON EVANS, Haverhill, Mass.  
Thesis with Alfred Whitney Evans
- WALTER GERRISH, III New York City.  
The Process of making a design and transferring it to point paper  
in order that it may be woven in a Jacquard Machine.



WILLIAM AUGUST RASCHE, III	New York City.
The Sateen Arrangement in Textile Fabrics.	
WALTER LAWRENCE STEWART, III	New York City.
Textile Coloring as applied to Suitings and Trouserings.	
WILFRED NATHANIEL BLOOM, IV.	Boston, Mass.
Sulphur Colors.	
GARABED NAJARIAN, IV.	Rowley, Mass.
Study of Aniline Blacks.	

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**Certificates for Partial Courses Awarded as follows :**

GEORGE EDWARD PETTY,	Lowell, Mass.
Cotton Spinning and Weaving.	
Thesis with Fred C. Morrison.	
MURRAY REID STEVENSON,	Clinton, Mass.
Designing and Weaving.	
Double Cloths and Their Arrangement.	
WILLIAM CARLETON ROBINSON,	Melrose Highlands, Mass.
Designing and Weaving.	
The Use of Life of the Animal Kingdom in Textile Designing.	
LOUISE PORTER CAMPBELL,	Lowell, Mass.
Decorative Art.	
ISABEL HALLIDAY REYNOLDS,	North Andover, Mass.
Decorative Art, Designing and Weaving.	
Color as Applied to Textile Design.	
ANNA G. WALKER,	Lowell, Mass.
Decorative Art.	
E. H. BENNETT,	Lynn, Mass.
Weaving. Thesis with Edward Spiegel.	
The Rise of the Shoddy Industry.	
EDWARD SPIEGEL,	New York City.
Weaving. Thesis with E. H. Bennett.	
CLARENCE HUTTON,	Lowell, Mass.
Designing. The relation of the Weave to the Fabric.	
BENJAMIN HOLGATE,	Lowell, Mass.
Weaving. Original Sateen and Leno stripe Gingham.	

# **EVENING CLASSES, MAY 14, 1903**

## **Certificates were awarded as follows :**

Charles Lawrence,	Cotton Spinning Course, Three Years.
F. E. Knowles,	" " " " "
F. A. Upton,	" " " " "
M. H. Varney,	" " " " "
George Goodchild,	" " " " "
F. A. Mason,	" " " " "
J. J. Keleher,	Worsted Spinning Course, Two Years.
Wilfred Lord,	" " " " "
Fenton Schoon,	" " " " "
Richard Nicholson,	" " " " "
H. D. Rockwell,	Woolen Spinning Course One Year.
J. H. Balmforth,	" " " " "
J. A. Higgins,	" " " " "
A. J. Baxter,	" " " " "
A. C. Gaunt,	" " " " "
Martha Balmforth,	Designing Course, Three Years.
E. J. Barry,	" " " " "
H. Bastow,	" " " " "
W. Garner,	" " " " "
J. Howard,	" " " " "
C. W. Martenson,	" " " " "
J. W. Myers,	" " " " "
D. T. Noonan,	" " " " "
G. B. Palmer,	" " " " "
J. S. Schofield,	" " " " "
M. Tonge,	" " " " "
J. J. Jennings,	" " " " "
A. L. Moir,	Post Graduate, Designing Course, One Year.
David Walker,	" " " " "
J. W. Myers,	Chemistry Course, Four Years.
B. I. Stokham,	" " " " "
R. Hunter,	Weaving Course, Two Years.
S. L. Johnson,	" " " " "
D. J. Cady,	" " " " "
J. W. Leach,	" " " " "
F. T. Donnellan,	" " " " "
W. S. Byam,	Mechanical Engineering Course, Two Years.
J. J. Fynn,	" " " " "
F. M. Gray,	" " " " "
H. L. Lincourt,	" " " " "
A. Mozley,	" " " " "

## List of Past Students

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[C] Indicates Certificates, Partial Course.

[D] Indicates Diploma, Complete Course.

### DAY COURSE, 1899.

NAME	COURSE	OCCUPATION
Bailey, J. W.	1 D	Principal, Fall River Textile School, Fall River, Mass.
Burrage, Katherine	111b C	Lowell, Mass.
Cuttle, J. H.	11 D	Designer, Arlington Mills, Lawrence, Mass.
Fels, A. B.	11 D	Mass. Electric Co., Boston, Mass.
Harriman, H. I.	v	With American Loom Co., Readville, Mass.
Hastings, Walter L.	1	Assistant to Agent, Arlington Mills, Lawrence, Mass.
Harmon, C. F.	1 D	In Business, Lowell, Mass.
Mackay, R. N.	1	With American Loom Company, Readville, Mass.
Smith, A. A.	1 D	Lowell, Mass.
Tilton, E. T.	11 D	With Assabet Mills, American Woolen Co., Maynard, Mass.

### EVENING COURSE, 1899.

Binns, Heaton	11 V C	Ingrain Yarn Dept., Bigelow Carpet Co., Lowell, Mass.
Broadbent, James T.,	1 C	Acting Director, A. and M. College, Textile Department, Mississippi.
Collier, John	111 C	Overseer of Weaving, Norwalk, Conn.
Crompton, H. H.	11 C	Second Hand, French Drawing, Arlington Mills, Lawrence, Mass.
Gaunt, A. C.	111 C	Designer, Tremont Worsted Co., Methuen.
Margerison, I. D.	11 C	Section Hand, Worsted Combing, Arlington Mills, Lawrence, Mass.
Kellett, Irvine	11 C	Second Hand, Worsted Spinning, Lower Pacific Mills, Lawrence, Mass.
McAllister, J. W.	v C	Herman Metz Co., Charlotte, N. C.
Moir, A. L.	111 C	Postal Clerk, Lowell, Mass.
Noble, J. T.	v C	Bookkeeper, Walsh Mill, Lowell, Mass.
Nugent, T. A.	11-V C	Second Hand, Bigelow Carpet Co., Lowell.
Spedding, E. H.	111 C	Second Hand, Weaving, Tremont and Suffolk, Lowell, Mass.

NAME	COURSE		OCCUPATION
Stevenson, Wm.	11	C	Supt. Franklin Woolen Mills, Franklin, Ky.
Stopherd, W. H.	11-v	C	Overseer, Bigelow Carpet Co., Lowell, Mass.
Swift, Edward S.	v	C	Yarn Commission Business, Lowell, Mass.
Wilmot, William	111	C	Designer for Hamilton Web Co., Hamilton, R. I.
Wilton, E. H.	111	C	Overseer of Designing, Stevens Mills, North Andover, Mass.

#### DAY COURSE, 1900.

Baldwin, A. L.	1v	D	Chemist, 534 Merrimack St., Lowell, Mass.
Barr, I. W.	1	D	Instructor, Armour Institute, Chicago, Ill.
Bodwell, H. A.	11	D	Asst. Supt. Smith and Dove Mfg. Co., Andover, Mass.
Brickett, E. J.	11	D	Instructor, Textile Dept. International Am. School of Correspondence, New Bedford, Mass.
Burrage, Katherine, P. G.	111b		See 1899 Day Course.
Campbell, Laura E.	111b	C	Lowell, Mass.
Goodhue, Amy H.	111b		Librarian, Dracut Public Library, Lowell.
Lakeman, Fannie S.	11b	C	Salem, Mass.
Lamson, George F.	1	D	Draftsman, Lewiston Machine Co., Lewiston, Me.
Leach, John P.	1-v	C	Foreman, Carding Dept., Harriet Cotton Mills, Henderson, N. C.
Merchant, Edith C.	111b	C	Lowell, Mass.
Parker, Harry C.	v	C	In Business, 112 Pleasant St., Fitchburg, Mass.
Perkins, John E.	111	D	Asst. Supt. and Designer, S. W. and C. Russell Woolen Mills, Pittsfield, Mass.
Pradel, A. J.	111	D	Designer, Russell Mfg. Co., Middleton, Conn.
Sleeper, Robt. R.	1v	D	With Herman Metz Co., Dyestuffs, New York City.
Smith, Stephen E.	1	D	Asst. Inst. Cotton Department, Lowell Textile School.
Stewart, A. A.	11	D	Inst. in Finishing, Lowell Textile School.
Syme, James F.	11	D	Agent Ray Mills, (American Woolen Co.,) Franklin, Mass.
Thompson, H. J.	1v	D	Dyer, Boston Rubber Shoe Co., Malden, Mass.
Woodies, Ida A.	11b	C	Asst. Inst. Art Department, Lowell Textile School.

#### EVENING COURSE, 1900.

Campbell, A. D.	11b	C	Section Hand, Worsted Drawing, Arlington, Mills, Lawrence, Mass.
Cawthra, A. B.	11b	C	Overseer, Worsted Spinning, U. S. Bunting Co., Lowell, Mass.
Colby, A. D.	1	C	Foreman Card Dept., Lowell Machine Shop, Lowell, Mass.
Donnelly, J.	1	C	Asst. Second Hand Mule Room, Tremont and Suffolk, Lowell, Mass.
Elston, F. R.	111	C	Designer, American Woolen Co., Fulton, N. Y.
Howard, J.	v	C	Overseer of Weaving, Lowell, Mass.

NAME	COURSE	OCCUPATION
Hutton, Clarence	v C	Asst. Designer, Oxford Mfg. Co., Oxford, Nova Scotia.
Jones, W. J.	11b C	Overseer Worsted Spinning, U. S. Bunting Co., Lowell, Mass.
Maden, H.	11b C	Second Hand Worsted Spinning, U. S. Bunting Co., Lowell, Mass.
Nelson, Ernest	11b C	Pattern Weaver, Massachusetts Mills, Lowell, Mass.
Ogley, S. A.	11b C	Section Hand, Worsted Spinning, Moore Spinning Co., North Chelmsford, Mass.
Osgood, C. F.	1 C	Draftsman, Lowell Machine Shop, Lowell.
Rowell, H. C.	1-11b C	Deceased, Lowell, Mass.
Silcox, A. E.	1 C	Draftsman, Lowell, Mass.
Snow, F. L.	1v C	Overseer, Dyeing and Bleaching, Lawrence Hosery, Lowell, Mass.
Wardrobe, W. L.	1 C	
Waterhouse, J.	1v C	Storekeeper, Merrimack Print Works, Lowell.
Wing, C. T.	111 C	Designer, Middlesex Mfg. Co., Lowell, Mass.
Woodbury, W. S.	1 C	Overseer, Carding, Millville, N. J.

#### DAY COURSE, 1901.

Bradley, Richard	v C	Loom Fixer, Atlantic Mills, Providence, R. I.
Buchan, D. C.	11 D	Loom Fixer, Ashland, N. H.
Currier, John A.	11 D	Asst. Supt. Hinsdale Mfg. Co., Hinsdale, N. H.
Donovan, D. F.	11a C	Second Hand, Woolen Carding, Stevens Mill, No. Andover, Mass.
Evison, Wm. A.	v C	Weaver, Lowell, Mass.
Farrell, T.	11a C	Woolen Spinner, Stirling Mills, Lowell, Mass.
Frame, Wm.	v C	Loomfixer, Lowell, Mass.
Gagan, J. H.	v C	Overseer, Stirling Mills, Lowell, Mass.
Grant, Archibald	11b C	Section Hand, Spinning and Twisting, Bigelow Carpet Co., Lowell, Mass.
Gourke, Michael	11b C	Section Hand, Worsted Combing, Bigelow Carpet Co., Lowell Mass.
Hill, Daniel	11b C	Worsted Spinner, Sanford Mills, Sanford, Me.
Hitchcock, T. B.	1-11-111 C	With the American Mills, Charlotte, N. C.
Holgate, C. H.	11a C	Wool Buyer, Boston, Mass.
Hunter, Ralph	111 C	Clerk, Joy Langdon & Co., Boston, Mass.
Jones, W. J.	11a C	5 Hazelton St. See 1900, Evening.
Killerby, Walter	11b C	Supt., Park Worsted Mills, Lowell, Mass.
Law, Alfred	11b C	Section Hand, Worsted Combing, Arlington Mills, Lawrence, Mass.
Lord, Wilfred	111 C	Asst. Designer, Lower Pacific Mills, Lawrence, Mass.
McQuade, H. B.	v C	Fixer, Lowell, Mass.
Minge, J. C.	111-1-v C	Sec. and Treas., B. Minge Mfg. Co., Demopolis, Ala.
Morris, Frank	v C	Loomfixer, Lowell, Mass.
Nelson, Ernest	11a C	Pattern Weaver, Mass. Mills, Lowell, Mass. See 1900, Evening.
Noble, J. T.	111 C	Bookkeeper, Walsh Mills. See 1899, Evening.
Peel, Hudson	11b C	Section Hand, Worsted Spinning, Arlington Mills, Lawrence, Mass.

### DAY COURSE, 1901.

NAME	COURSE	OCCUPATION
Ewer, N. T.	IV D	With N. Y. and Boston Dyewood Co., East Boston, Mass.
Foster, C. E.	II D	With Davis & Furber Machine Co., North Andover, Mass.
Goodhue, Amy H.	111b C P G	See 1900 Day.
Kingsbury, P. F.	IV D	Color Maker, Hamilton Print Works, Lowell, Mass.
Marinel, W. N.	I D	
Moorhouse, W. R.	IV D	Instructor in Dyeing, Lowell Textile School, Lowell, Mass.
Parker, B. M.	I D	Instructor Textile Department, Clemson College, N. C.
Webber, A. H.	IV D	Dyer, F. E. Atteaux & Co., Boston, Mass.
Wise, P. T.	II D	Supt. Brookside Mill, W. Chelmsford, Mass.
Woodies, Ada A.	111b C P G	See 1900 Day.

### EVENING COURSE, 1901.

Aspinwall, Wm.	11b C	Section Hand, Worsted Carding, Arlington Mills, Lawrence, Mass.
Berry, F. M.	V C	Deceased.
Brooks, Noah	111-V C	
Burghardt, P. C.	11a C	Second Hand, Card Room Merrimack Woolen Co., Lowell, Mass.
Buzzell, Win. O.	111 C	Assistant, Designer, Acushnet Mills, New Bedford, Mass.
Cheetham, J. J.	111 C	Overseer, Mule Spinning, Massachusetts Mills, Lowell, Mass.
Chippendale, E. W.	11b C	Second Hand, Worsted Combing, U. S. Bunt- ing Co., Lowell Mass.
Cowdell, Herbert	V C	Fixer, Massachusetts Mills, Lowell.
Davis, Henry	11b C	Overseer, Worsted Carding, Hudson, Mass.
Reynolds, H. L.	111 C	Second Hand, Card Room, Merrimack Mfg. Co., Lowell, Mass.
Saunders, E. B.	111 C	Second Hand, Weave Room, Fall River Iron Works Co., Fall River, Mass.
Scanlon, E. J.	11b C	Section Hand, Worsted Combing, Arlington Mills, Lawrence, Mass.
Shannon, Philip	V C	Fixer, Belvidere Mill, Lowell, Mass.
Smith, Fred	11b C	Second Hand, Worsted Spinning, Arlington Mills, Lawrence, Mass.
Swift, E. S.	I C	See 1899 Evening.
Wesson, Paul B.	I C	Foreman, Lowell Machine Shop, Lowell, Mass.
Whitehead, Bennett	11b C	Section Hand, Worsted Spinning, Arlington Mills, Lawrence, Mass.
Willey, Frank S.	I C	Second Hand, Carding, Lawrence, Mass.
Williamson, I. F.	IV C	Second Hand, Hamilton Print Works, Lowell, Mass.



# DAY COURSE, 1902.

NAME	COURSE		OCCUPATION
Burnham, Frank E.	IV	D	Chemist, Arlington Mills, Lawrence, Mass.
Carter, Robert R.	IV	D	Assistant Dyer, Hyde Park Woolen Mills, Hyde Park, Mass.
Craig, C. E.	111	D	Designer, Nockegee Mills, Fitchburg, Mass.
Curran, C. E.	11	C	Assistant Designer, Washington Mills Lawrence, Mass.
Ferguson, A. F.	1	C	Assistant Instructor, Lowell Textile School, Design Department, Lowell, Mass.
Harris, George S.	1	C	Supt. Sycamore Mills, Sycamore, Ala.
Haskell, Walter F.	IV	D	Dyer, Dana Warp Co., Westbrook, Me.
Holgate, Benj.	111	C	Office, Lowell Textile School, Lowell, Mass.
Ramsdell, T. E.	1	D	Agent, Monument Mills, Housatonic, Mass.
Swift, E. S.	111	D	See Evening 1899 and 1901.
Wing, C. T.	111	D	Designer, Middlesex Mills, Lowell. See 1900 Evening.
Woodman, H. L.	1	C	Lowell Machine Shop, Lowell, Mass.

# EVENING COURSE, 1902.

Adams, W. R.	11a	C	Pressman, Stevens Mills, Lowell, Mass.
Barlow, R.	v	C	Finishing Dept., Hamilton Mfg. Co., Lowell, Mass.
Binns, Heaton	v1	C	See Evening 1899.
Bowring, G. P.	v1	C	Lowell Machine Shop.
Brainerd, Irving L.	1	C	Second Hand, Lower Pacific Mills, Lawrence.
Burkhard, E.	11a	C	98 Union St., Lawrence, Mass.
Buzzell, Wm. O.	111	C	P. G. See 1901, Evening.
Cheetham, J. J.	111	C	P. G. See 1901, Evening.
Collier, J.	111	C	P. G. See 1899, Evening.
Cowdrey, C. E.	v	C	Talbot Mills, No. Billerica, Mass.
Cremin, D. J.	1	C	Second Hand, Boott Cotton Mills, Lowell.
Donnellan, Frank T.	11a	C	Runner, Lowell Textile School.
Dudley, George E.	1	C	Third Hand, Carding, Massachusetts Co., Lowell, Mass.
Ferguson, T.	v	C	Loom Fixer, Appleton Mills, Lowell, Mass.
Field, C. W.	v1	C	Mechanic, Tremont & Suffolk, Lowell.
Forest, F. C.	11a	C	Finishing Room, Middlesex Co., Lowell.
Fortune, D. A.	11b	C	Section Hand, Worsted Spinning, Lower Pacific Mills, Lawrence, Mass.
Gaunt, A. C.	111	C	P. G. See 1899, Evening.
Good, Henry	1	C	Carder, Durfee Mills, Fall River, Mass.
Haigh, W.	111	C	U. S. Bunting Co., Lowell, Mass.
Haworth, J.	v1	C	Pentagraphing, Merrimack Mfg. Co., Lowell.
Hogan, J.	v	C	
Hoyle, E.	11b	C	Section Hand, Worsted Drawing, Moore's Mill, West Chelmsford, Mass.
Johnson, E. A.	11b	C	Asst. Supt., Worsted Yarn Dept., Washington Mills, Lawrence, Mass.
Kelley, M. H.	1	C	Appleton Co.

NAME	COURSE	OCCUPATION
Kent, E. J.	11b	Section Hand, Worsted Drawing, Lower Pacific Mills, Lawrence, Mass.
Lamont, W. A.	11b C	Asst. Supt., Worsted Yarn Dept., Washington Mills, Lawrence, Mass.
Lawless, A. J.	v C	Overseer Weaving, Belvidere Woolen Mills, Lowell, Mass.
Lee, Charless	i C	Third Hand, Boott Cotton Mills, Lowell.
Leith, E. E.	111 C	Designer, Abbots Mills Dexter, Me.
Libby, C. R.	1v C	Draughtsman, Lamson, C. S. S Co., Lowell.
Malloy, A.	v C	Beamer, Tremont & Suffolk Mills, Lowell.
Nugent, T. A.	vi C	See 1899, Eventng.
Osgood, C. F.	vi C	See 1900, Evening.
Potter, R. W.	v C	Loom Fixer, Barber Tape Mill, Lowell.
Rockwell, S.	11a C	Supt. Mule Dept. Davis & Furber Machine Co., Lowell, Mass.
Schermerhorn, George E.	i C	Comber Fitter, Lawrence Mfg. Co., Lowell.
Smith, W. H.	11b C	Section Hand, Worsted Spinning, Arlington Mills, Lawrence, Mass.
Stevenson, Wm.	111 C	See 1899, Evening.
Stopherd, W. H.	vi C	See 1899, Evening.
Umpleby, T. B.	v C	Supt. Mapleleaf Woolen Co., Ontario, Canada.
Varney, M. H.	111 C	With Amory Mfg. Co., Manchester, N. H.
Vogt, A. H.	111 C	Designing Room, George E. Kunhardt, Lawrence, Mass.
Walker, David	111 C	Cloth Inspector, Collinsville, Mass.
Wilson, C. E.	11b C	Section Hand, Worsted Twisting, Arlington Mills, Lawrence, Mass.
Wilson, G. H.	11b C	Section Hand, Worsted Spinning, Lower Pacific Mills, Lawrence, Mass.
Wood, Jno.	i C	Second Hand, Boott Mills, Lowell, Mass.



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Fill out and send to Wm. W. Crosby, Principal

# Lowell Textile School,

LOWELL, MASS.

## APPLICATION BLANK.

Date.....

I, ..... hereby  
apply for admission to the Lowell Textile School as **EVENING**  
student.

Name in Full,.....

Date and Place of Birth,.....

Home Residence,.....

Parent or Guardian,.....

Residence of Parent,.....

School last attended,.....

( INDICATE COURSE )

DAY { I. Cotton Manufacturing.  
II. Wool Manufacturing.  
III. Designing.  
IV. Chemistry and Dyeing.  
V. Weaving.

EVEN- { I. Cotton Spinning.  
ING. { II. Woolen and Worsted Spin'ng  
III. Designing.  
IV. Chemistry and Dyeing.  
V. Weaving. Warp Preparation.  
VI. Mechanical Engineering.

Signature,.....

**ENDORSEMENT BY SOME OFFICER OF SCHOOL LAST ATTENDED.**

I hereby certify that .....  
the above applicant is duly qualified to pursue with profit the  
work of the Lowell Textile School.

Signed :.....

Principal..... School, located  
at..... State of.....

Date .....



**BULLETIN**

OF THE

**Lowell Textile School**

Lowell, Massachusetts, U. S. A.



---

**ISSUED QUARTERLY**

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Entered Aug. 26, 1902, at Lowell, Massachusetts  
as second-class matter under Act of  
Congress, July 16, 1894

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**Moody Street and Colonial Avenue.**

[FOR BULLETIN AND TERMS ADDRESS WM. W. CROSBY, PRINCIPAL



## Decorative Art Department

---

As textiles would be tame and comparatively uninteresting without the beauty added by design, so a textile school would be quite incomplete without a department for teaching an art, the introduction of which into textiles presents an element which has been such an important factor in its commercial value. With this thought in mind no pains have been spared to make the Art department one of the most important in the school.

This department of the Lowell Textile School was incorporated very early in the school's history, being fully equipped and in running order before the end of the first year. Beginning with a few pupils in the charge of Prof. George with a session of three days a week, it has now grown until it now requires sessions every day, and besides the time given by the head instructor, has the addition of an assistant.

In the new building a large, well lighted studio has been provided with every convenience for carrying on the work in the most satisfactory manner. Besides the tables and easels necessary for the execution of the work, many beautiful plaster casts, pieces of bric-a-brac, and examples of ornament are provided, from which the students may make drawings and study composition. There is a superb library comprising several hundred plates representing the Owen Jones "Grammar of Ornament," and "Racinet on Ornament," studies of plant form from nature and in design compositions so prepared that they may be of the greatest possible value to the pupils, inasmuch as the plates are mounted on separate pieces of card-board and bound with tape. In this manner the plates can be distributed and easily handled by the pupils.

Many of the students have gone to occupy positions where the instruction given them at the school has been of great value and profit, and many of the designs made in the class room have been sold to the manufacturers and used in the production of marketable goods.

The work of the department includes teaching of color and design to the entering class, including lectures on historical ornament, and the application of designs to textiles. To the second and third year students who are taking the textile design course, extra work is given in the further development of the principles learned in the first year's course. Then there are students taking special work in oil and water color painting, interior 'decoration, and the designing of wall papers, carpets, and textiles of various kinds, book covers, etc.

It is surprising to note the various demands that are made upon this department for instruction along different lines; and for the accommodation of special students practically every branch of Decorative Art has been taught. The teaching of perspective is included in the course, and has proved especially interesting to architects desiring to learn how to render pictorial water color effects on their plans for houses. Special students have found the work in this department especially profitable in cases where they desire to learn to paint in oils or water colors and have become tired of the kind of instruction which simply makes them amateurs in this line of work. Learning as they do at school the principles of their profession and how to use these principles in such a manner that when they are by themselves they are capable of carrying on successfully their own compositions and paintings from nature. It is very interesting to watch the speedy development of this class and it is rather remarkable how much even one year of proper study will do for the development of this particular art.

Graduates from this department are securing positions in various industries, among which are those of interior decoration, stained glass window designing, textile designing, teaching, wall paper designing, architectural rendering, oils, water colors, etc.

Since the establishment of the course many very beautiful designs have been produced by the pupils, and although it is the custom of the school to return most of the work to the students yet from time to time designs have been selected for permanent inspection and may be seen upon the walls of the department.



## Designing Department

---

A practical designer or an experienced manufacturer when entering the design department is immediately impressed by the resemblance to mill life apparent in every corner of the department.

The design office used by Professor Umpleby and his assistants for the various purposes pertaining to instruction in the different branches of design is located immediately above the general office and on the second floor of the north wing of Southwick Hall. The visitor entering this office is at once attracted by the collection of prize medal fabrics from the exposition at Paris in 1901. This collection fills a cabinet on one side of the office and includes many samples of the perfection attainable in the craft of design.

Nearby is the section devoted to analytical work. Here may be seen delicately balanced scales, avoirdupois and metric, used for analyzing fabrics by either the English or Metric system. The inevitable mallet and dies for stamping out one square inch, four square inches, or one square decimeter of cloth with the testing apparatus for determining the proportions of the various fibres in woven fabrics of any description, complete this section. The equipment fills an interesting corner of the room. Practical work is given students in analyzing fabrics by the English and Metric systems, the results in each are compared, thus affording opportunities to test the merits or demerits of either of the principal methods now in use in America and Europe. Many interesting tests are also made to determine the proportions of wool, cotton, and other fibres in trouserings, double cloths and other fabrics in daily use.

Between the windows and occupying the Moody Street side of the office are cases containing the nucleus of a valuable technical library. Standard works written by authorities on the various branches of the designing, weaving, and finishing of fabrics prove

interesting to many visitors. Not only does this library contain books on modern fabrics, but descriptive articles on the cloths of ancient Greece and Rome, of the dark ages, and continuing through succeeding periods to the latest productions of the loom.

The administrative section occupies a corner near the library. Here the lectures and practical work for the classes are prepared. On the walls of the office are many examples of work done by the students. Plates illustrating the methods of designing fabrics, color effects, and samples of cloth woven in the hand loom department give evidence of the thoroughness of instruction given in this department.

Adjoining the office is the class room in which the freshmen class receives instruction in design and cloth analysis. The most important feature of this room is the collection of yarns in the various stages of spinning. The process of cotton yarn spinning is shown in detail from the raw stock to the finely spun mule or ring yarn. The same is true of linen, and novelty yarns.

The remaining room of this department where the sophomore and senior classes meet for instruction, overlooks the campus. The class rooms are adequately equipped with blackboards and design boards upon which designs explained in the lectures are pegged.

The design course is divided into four general divisions. Design construction, cloth construction, cloth analysis and hand looms. Instruction in design construction includes lectures on cotton, woolen, worsted and union fabrics, using as a basis a plain cloth. The different parts of cloth are explained in detail and methods of representing weaves, drafts, and chains on design paper are given practical illustrations. The principles of twills, sateens, broken twills, color effects, trouserings, double cloths and triple cloths are taught in succession until the more complicated fabrics such as lenos and jacquards are reached, marking the completion of a thorough design course. Cloth construction is the process of calculations for single and ply yarns, number of reeds and harnesses, shrinkages and other data necessary for the production of a woven fabric.

Cloth analysis is given thoroughly. Numerous data in take up and shrinkage are given students, and from these calculations weights and counts of warp and filling in finished cloth, and in loom, reed, and other particulars to reproduce fabrics must be determined.



Hand looms form an important part of the students' work in design. Reproductions of popular fabrics or original designs give opportunities for practical application of the theories advanced in design and cloth analysis.

The head of the department, Professor Fenwick Umpleby, who holds the City and Guilds of London diploma and also four consecutive certificates from the designing course of the Yorkshire College, Leeds, England, came to the school after thirty years of practical experience in mill life, working in every department from picker house to finishing and shipping room, for such noted firms as the Antwerp mills, Leeds, England; Queen St. Mills, Batley, England; Globe mills, Utica, N. Y.; Auburn mills, Peterboro, Ontario, Canada; G. H. Gilbert Co., Gilbertville, Mass.; James Lees & Sons, Bridgeport, Pa. In each of these mills he acted as designer or superintendent.

*Extracts from the quarterly Bulletin of the National Association of Wool Manufacturers, Hon. S. N. D. North, secretary, now director of the Census, National Department of Commerce and Labor. See bound volumes No. 33, page 188, June, 1903.*

"Sir Swire Smith, of Keighley, England, paid a brief visit to the United States during the month of April last. His time was largely taken up by private business affairs, but while in New England he was able to look at some of our great wool manufacturing establishments,, and more particularly to study the development of technical education here, as illustrated in the Massachusetts Institute of Technology and the Lowell Textile school.

"Sir Swire Smith is one of the largest and most successful worsted spinners in the Yorkshire district, but he is most widely known as the leading spirit and advocate of the "new education" or technical training in Great Britain. He was one of the members of the royal commission to inquire into technical instruction appointed by Queen Victoria in 1881, the chairman of which was Hon. B. Samuelson, member of Parliament. The royal commission studied the subject in all the European countries, sending also a sub-commission to the United States. Its report is regarded as the most important contribution ever made to the literature of this subject, and exerted a remarkable influence in England, where a number of high grade institutions for technical training, established in the last 20 years, are directly traceable to the influence of this report.



“That portion which relates to the importance of technical education in the textile industries was wholly the work of Sir Swire Smith, and remains the most complete and valuable compendium of information on this subject. He has followed the matter with an enthusiastic persistence ever since, constantly publishing and speaking on the subject, and almost always present when a new textile school or technical institution of any kind was opened to make the dedicatory address. For his distinguished services to the cause he was knighted by Queen Victoria on the occasion of the Diamond Jubilee in 1897.

At a private dinner tendered to him by Mr. William Whitman, at the Union club of Boston, on Wednesday, April 15, he said :

“Yesterday I was privileged to inspect the Boston Institute of Technology, and see the new developments in the mechanical, electrical and naval engineering ; today I have visited the textile school of Lowell, and what I saw reminded me of a visit to one of the great technical schools of Germany some years ago in company with the minister of education. ‘When I was in England,’ he remarked, ‘I was shown your great workshops where you made your engines and machinery ; this is one of the workshops where we make our men.’ Gentlemen, you have shown me the workshops where you make your men. I find in them an absolute guarantee of the progress of your industries and the highest development of your civilization.

“Your textile school of Lowell greatly impressed me by its *practical character*, and I have formed the highest expectations of its future influence and success. The building has been erected on a noble scale, and its equipment of apparatus and machinery has been started with an eye to *practical usefulness*. The directors seem to be acting on a sound principle, not so much to supersede the practical experience of the factory as to teach the students the principles underlying factory work, so that they may apply true artistic and scientific knowledge to the designing, construction, and dyeing of textile goods in all materials.

“I have found a department in which instruction in pure art will be given in its application to textiles. The chemical department will give a foundation in chemistry that may be applied to dyeing, color-making, and to the industrial arts. In the same way the principles of mechanical and electrical engineering are so taught as to be capable of application to all forms of construction and practical utility.

“Then you have not forgotten the commercial department and the training in foreign languages and in methods of distribution. We are sadly lacking in this knowledge in England. It is said that in London from thirty to forty per cent. of the clerks and correspondents in the houses engaged in foreign trade are foreigners ; and not long ago a young German wrote home to his friends, saying : ‘ You will be sorry to hear that we have still one Englishman in our office.’

“I congratulate you with all my heart on what I have seen at Lowell today. Your school is very young and it has not yet gathered around it the equipment of some of the great schools on our side, yet in full remembrance of Crefeld, Vienna, Chemnitz, and some other continental cities that have established famous and historic schools, and of Bradford, Leeds, and Manchester, that in certain directions have risen to their responsibilities, I have to say that the Lowell school, if completed on a scale on which it is already partially furnished and organized, will not be surpassed by any school in the world. This is a great triumph for New England, but it is only what we expect ; you see what others are doing, and then you go one better.”

The efficiency of the Lowell Textile school as indicated by the attendance from the high schools, academies and higher educational institutions and from the mills and shops where there is daily opportunity for exchange of views and for observing the efficiency of the graduates in actual manufacture.

---

The laboratory for testing textile materials is now in operation and the new testing machinery, nearly all of which has been specially designed and built for the use of the school is proving most satisfactory. The strength testers are particularly adapted for both accuracy and speed.

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Applications may be sent in for admission to the fall classes for the courses in Cotton or Wool Manufacturing, Textile Designing, Decorative Art, Chemistry and Dyeing, Weaving, and Mechanical and Electrical Engineering.

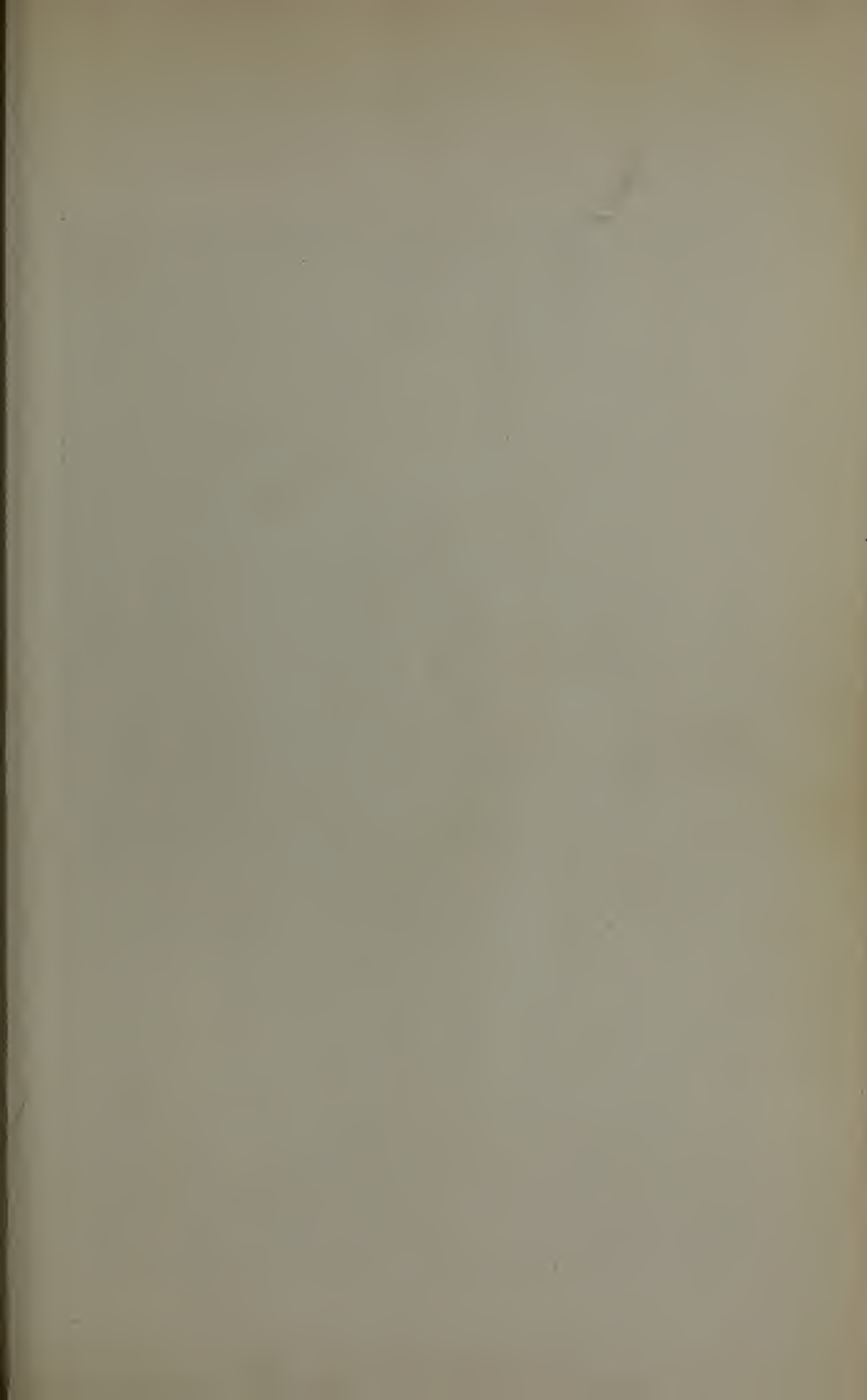
For further particulars, terms, or details of courses, address

**WILLIAM W. CROSBY,**

**Lowell Textile School,**

**LOWELL, MASS.**







SOUTHWICK HALL

FALMOUTH STREET BUILDING

SERIES 7, No. 4.

*May, 1904*

BULLETIN  
OF THE  
Lowell Textile School  
LOWELL, MASS.

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*Issued Quarterly*

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1904 - 1905

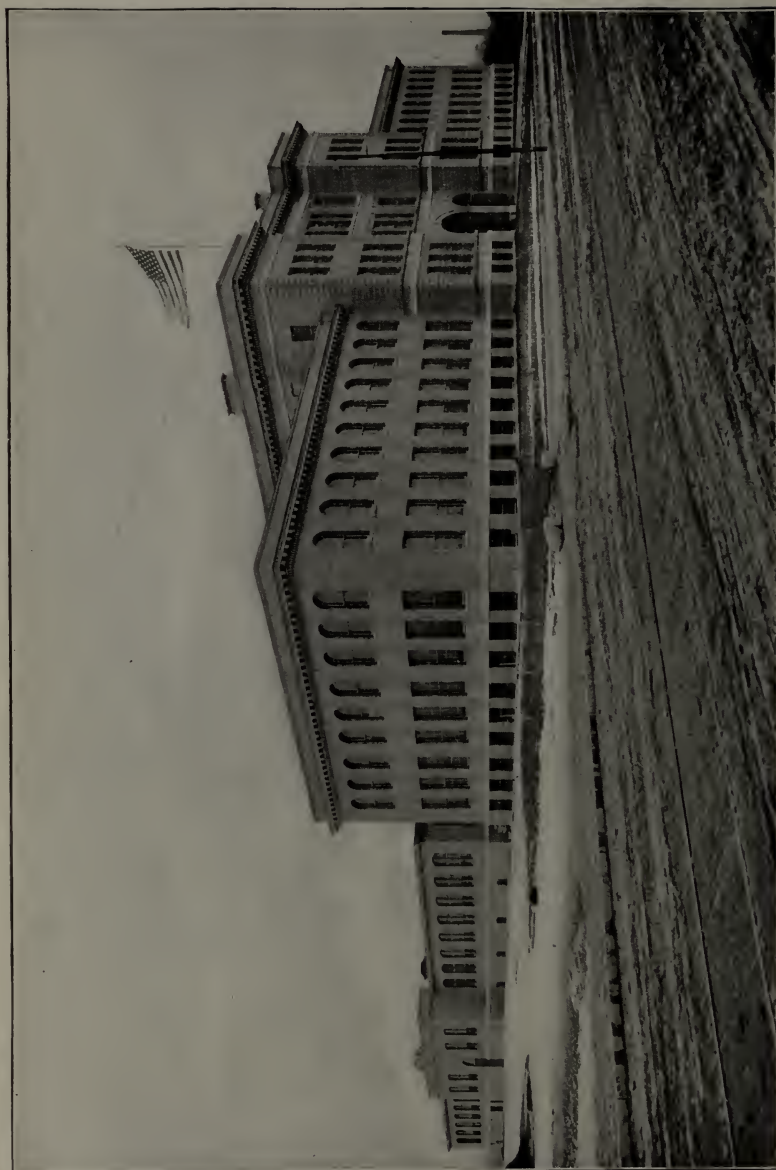
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Entered August 26, 1902, at Lowell, Mass., as second class matter,  
under Act of Congress of July 16, 1894.

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*Moody Street and Colonial Avenue*





KITSON HALL

SOUTHWICK HALL

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(INCORPORATED 1895)

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---

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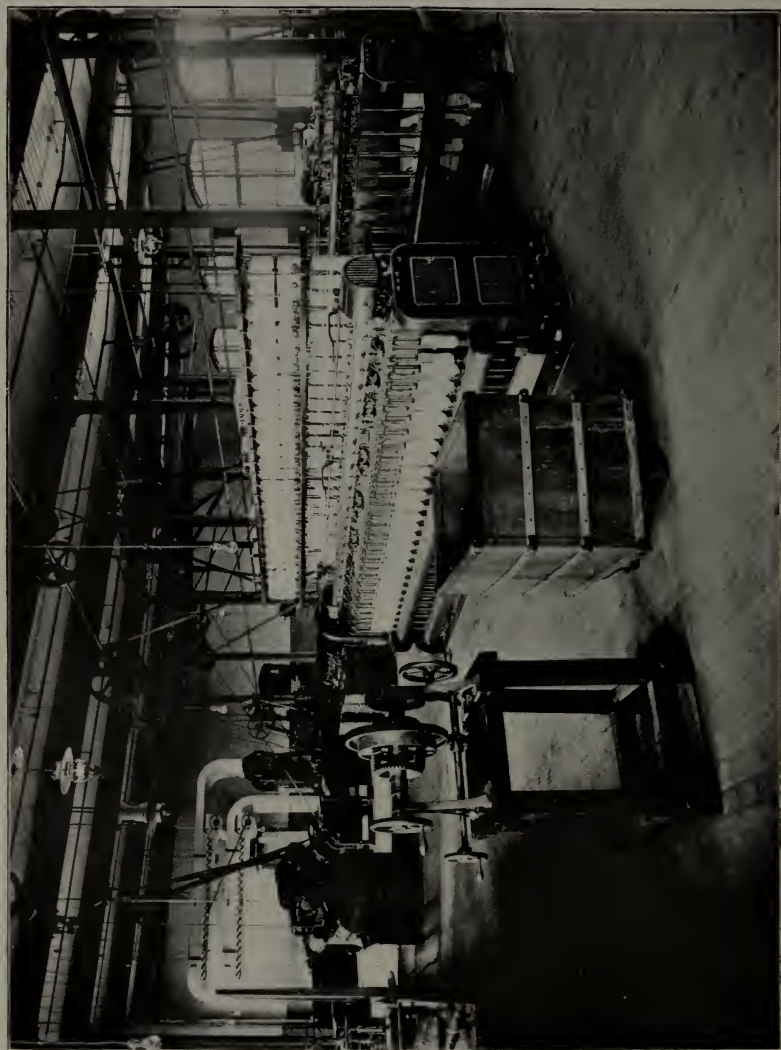
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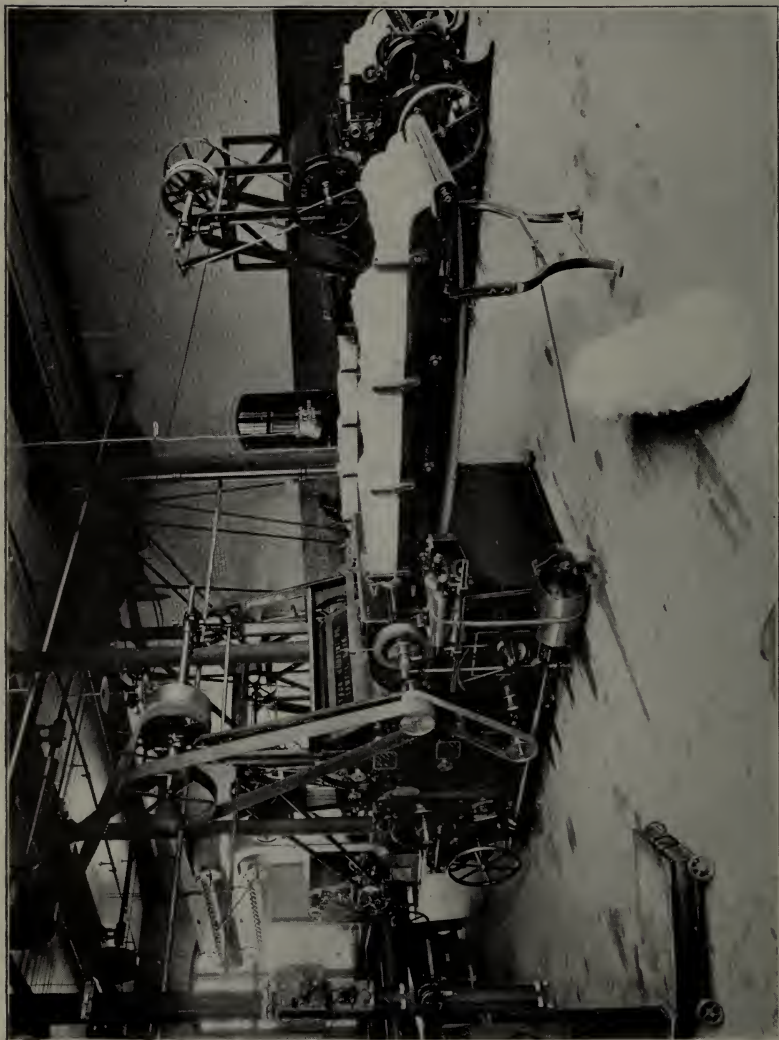
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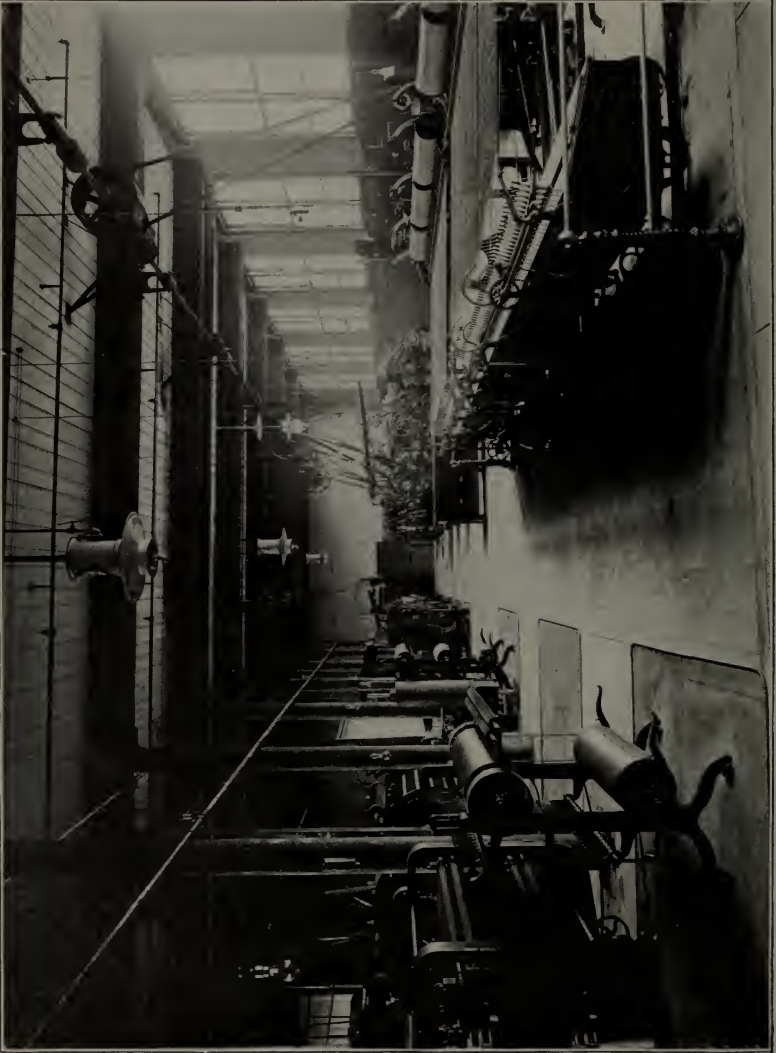
E. H. BARKER

G. H. PERKINS

S. E. SMITH

ARTHUR STEWART

C. H. EAMES



WOOLEN AND WORSTED YARN DEPARTMENT

# CALENDAR

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## 1904

Entrance examination for day students, Thursday, Sept. 15, at 10 a. m.

Examination for advanced standing, Thursday, Sept. 22, at 10 a. m.

Entrance examination for evening students, Thursday, Sept. 22, at 7 p. m.  
(For additional examinations for evening classes. see announcement.)

School year begins (day) Tuesday, Sept. 27.

Evening school year begins Monday, October 17.

Thanksgiving recess, Thursday, Nov. 24 to Saturday, Nov. 26, inclusive.

Christmas recess, Friday, Dec. 23, to Tuesday, Jan. 3, 1905, inclusive.

## 1905

Semi-annual examinations begin Wednesday, January 18.

Second term begins Monday, January 30.

Annual examinations begin Tuesday, May 16.

Diplomas awarded Thursday, June 1.

First entrance examinations Friday, June 2, at 10 a. m.

Second entrance examination, Thursday, June 15.

There will be no sessions of the school on Washington's birthday or on Patriots' Day.



WOOLEN AND WORSTED  
YARN DEPARTMENT



# The Lowell Textile School

---

The establishing of a school in Lowell for thorough instruction in the theory and practical art of manufacturing all commercial fibres, although proposed early in 1891, was not determined upon until the organization, methods and scope of such foreign schools, especially in England, France, Switzerland, Germany and Russia, had been carefully studied, and their permanence and value to the textile interests of those countries made clearly apparent.

The "Trustees of the Lowell Textile School" are incorporated under a special act of the Massachusetts Legislature, "for the purpose of establishing and maintaining a Textile school for instruction in the theory and practical art of textile and kindred branches of industry."

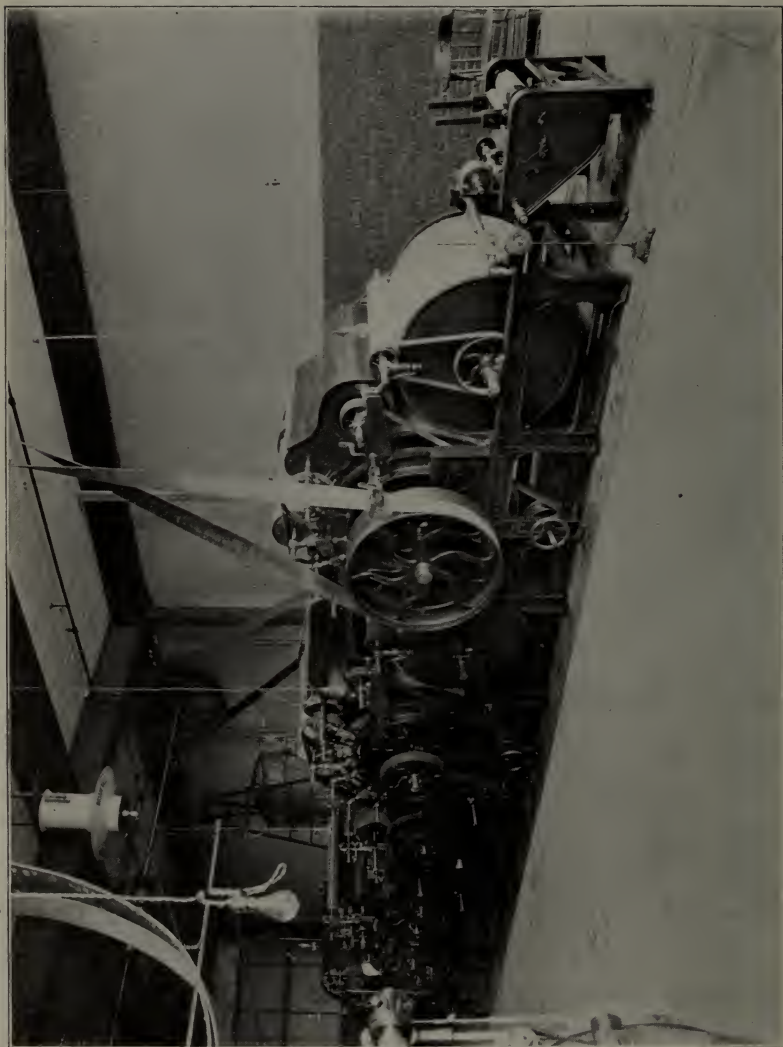
The incorporators are mainly representatives either as president, treasurer, agent or superintendent, of the management of the great textile corporations of Lowell, Lawrence and vicinity, in the Merrimack Valley, with an aggregate capital of over \$65,000,000. By the terms of the By-Laws, at least three-fourths of the Trustees must be "persons actually engaged in or connected with textile or kindred manufactures." This insures the practical character of the management and instruction.

The School is located in Lowell, Massachusetts, the "Mother Textile City of America," the city and state affording financial aid, the manufacturers of New England being equally liberal in contributions. The advantages of the location at a textile centre where every commercial fibre enters into the products, the student thus being directly in touch with the textile industry and the management thereof, will be apparant.

The School was formally opened by His Excellency, Gov. Wolcott, on January 30, 1897, in the presence of a large gathering of gentlemen interested in textile industries from all parts of New England. Instruction was commenced on February 1, 1897, and the classes have been regularly conducted since that time with ever increasing attendance.

The permanent home of the School was dedicated on February 12, 1903, by His Excellency, Gov. John L. Bates, and a large





WORSTED CARD

number of guests representing the great textile manufacturing and commercial interests of the Commonwealth.

As the larger percentage of the students in the regular day classes come directly from the high schools and academies, it has been found necessary to make the curriculum and instruction in the pure science branches especially in General Chemistry, Decorative Art and Mechanics as thorough as in the higher scientific institutions.

The principles of science and art are taught, not with the object of educating professional scientific men, but with a view to industrial and commercial application; but the School offers to graduates of universities and scientific institutions the advantage of technical instruction in the practical application of certain sciences. It also offers special facilities to those entering commercial life for obtaining such knowledge of the construction of textile fabrics and of the languages of foreign commerce as is essential in the marketing of goods abroad.

The equipment of the School consists of high grade machinery with all latest improvements, specially built to afford facilities for all kinds of experimental work, and of such variety as is never found in any one textile mill. With the machinery that is already installed, the School has a more varied equipment than any other existing textile school either in America or Europe, foreign schools being generally confined to instruction in the manipulation of one class of fibres only; namely, that used in the district where the school is located.

The lecturers and instructors are drawn from the leading scientific and art institutes of Europe and America, including those who have had special experience in textile school work and in the various processes of textile manufacture, the purpose of the management having been from the first to furnish as thorough scientific instruction in textiles and textile machine manufacture, as is furnished by any technological institution in the branches of industry to which it relates.

### Day Classes

These are especially intended for the instruction of those whose intention it is to enter the business of textile manufacturing in any branch. The courses are sufficiently complete to enable one to start without any previous acquaintance with textiles; but at the same time those who have been engaged in such business and wish to improve their knowledge and experience, can devote their entire time to study most profitably.



WORSTED COME

Each course is intended to cover three years. It is optional whether or not a student continues the full course of three years, but this is strongly recommended.

There is one term of preliminary instruction, which is common to all courses. At the end of this term, each student is required to select which of the courses he is to follow in his subsequent studies, and the instruction to be given after the first term of the first year is specialized to suit each course.

The four regular diploma courses are:

- I. Cotton Manufacturing.
- II. Wool Manufacturing.
- III. Designing. General Course.
- IV. Chemistry and Dyeing.

### **Evening Classes**

It is intended to give evening instruction to those who are engaged during the day in mills and work shops, to enable them to perfect their knowledge of the branches in which they work, to acquire knowledge of other processes than those in which they are regularly engaged, and to complete in the course of several winters, a thorough technical education without interfering with their daily duties.

Evening students have the option of entering for one or more of six different courses, and arrangements will be made as far as possible for them to take such a section of each course as is suited to the student's daily occupation in the mill.

- I. Cotton Spinning.
- II. (a) Woolen Spinning. (b) Worsted Spinning.
- III. Designing.
- IV. Chemistry and Dyeing.
- V. (a) Warp Preparation. (b) Weaving.
- VI. Mechanical Engineering.

Course IV requires four years, course III, three years; courses I, IIb, V and VI two years each; course IIa, one year.

For the satisfactory completion of either of these courses, the certificate of the school will be awarded; the diploma of the school will be awarded in exchange for certificates of satisfactory completion of those subjects which go to make up any one of the several regular diploma courses.





TEXTILE DESIGN DEPARTMENT

In general it is possible to take up the study of two of the above evening courses concurrently.

### **Women's Department**

Among the many fields in which woman has entered, none has been found in which her natural refinements of taste and skill can be used to better advantage than in designing; but natural ability, though the prime requisite is by no means all, for a certain amount of technical knowledge must be gained to achieve success. This department combines decorative art and textile design, and in general requires attendance on four afternoons per week; the studio is open throughout the week however, and an instructor is in attendance.

### **Commercial Department**

A special course in textile construction and foreign languages is arranged for those contemplating a commercial career.

All such are invited to communicate with the Principal, since there is demanded in such a course a greater variety of combinations of studies than in the manufacturing courses.

### **The Permanent Home**

On January 1st, 1903, the School was transferred from the rented quarters that it had occupied for five years, to the site and buildings where it is permanently located.

The site is a commanding one, consisting of ten acres at a high elevation, on the west bank of Merrimack River, extending to and overlooking the rapids of Pawtucket Falls, the first to be utilized for power weaving in America on an extensive scale. The site was contributed by Frederic Fanning Ayer, Esq., of New York City and the Proprietors of the Locks and Canals of Merrimac River. The buildings consist of Southwick Hall, Kitson Hall and one on Falmouth Street not yet named.

Southwick Hall includes a central mass 90 x 90 ft. having three stories and the wings 80 x 85 ft. with two stories and a well lighted basement. The building is pierced in the centre by an arched way from which access is had to the wings and to the central courtyard.

Kitson Hall makes a right angle with Southwick Hall and is 60 x 252 ft. with one story and a basement. It is occupied by the Cotton Yarn Department and heating, lighting, ventilating and power plant.

Falmouth Street Building forms the third side of the quadrangle and consists of two portions, one 75 x 130 ft., two stories, and the





FABRIC STRUCTURE AND  
CLOTH ANALYSIS

head house 70 x 80 ft., three stories and basement. This building is occupied by the departments of weaving and wool yarns. The head house provides for an extension of these departments, for wool scouring, carbonizing, conditioning, etc., and for knitting.

The buildings are all faced with light brick with granite and Indiana lime stone trimmings and are of modern mill construction adapted to educational uses. The floor space of the School is quadrupled in the new home permitting of a very large increase in equipment and is now occupied by the several departments as follows:

Cotton Spinning,	14,000 sq. ft.
Woolen and Worsted Spinning,	20,700 " "
Decorative Art and Textile Design,	14,000 " "
General Chemistry and Dyeing Laboratories,	14,000 " "
Dye House,	6,000 " "
Finishing Room,	5,000 " "
Power Weaving,	15,600 " "
Knitting,	5,600 " "
Mechanical and Electrical Engineering,	8,600 " "

Southwick Hall was contributed by the Commonwealth of Massachusetts and Frederic Fanning Ayer, Esquire, of New York City, and is a memorial to Royal Southwick, a leading textile manufacturer, a public man of earlier days, and a maternal ancestor of Mr. Ayer.

Kitson Hall, dedicated to the memory of Richard Kitson, was contributed by Charlotte P. Kitson and Emma K. Stott, his daughters; the Kitson Machine Company of Lowell, founded by him, was also a generous contributor.

### Equipments

The equipment of machinery is the most varied in the world for textile educational purposes, and is being constantly augmented. The entire plant, including grounds, buildings and equipment now exceeds \$500,000 in value.

#### **The Equipment of the Cotton Spinning Department Includes:**

One process system of Kitson Picking Machinery from works of Kitson Machine Co., Lowell, Mass., as follows:

One Number Seven Opener with Automatic Feeder connected by Robinson Patent Cleaning Trunk to

One 40 in. one Beater Breaker Lapper with Condenser and Gauge Box Feed.



STUDIO  
DECORATIVE ART DEPARTMENT

One 40in. one Beater Intermediate Finisher Lapper with Perham and Davis Sectional Plate Evener, apron to double four laps.

One 40 in. one Beater Finisher Lapper with Perham & Davis Sectional Plate Evener, apron to double four times, Kirschner Pat. Carding Beater.

One Roving Waste Opener.

One Thread Extractor.

Card Grinding Rolls, Stripping Rolls, etc.

One Sliver Lap Machine, made by the Mason Machine Works, Taunton, Mass.

One Comb, made by the Mason Machine Works, Taunton, Mass.

The following machinery from the Lowell Machine Shop, Lowell, Mass.:

One Top Flat Card.

Three Revolving Flat Cards.

Two Railway Heads.

Two Drawing Frames.

One Slubber.

One Intermediate.

One Fine Frame.

One Jack Frame.

Three Ring Spinning Frames.

One Spinning Mule.

One Spooler.

Wet and Dry Twister.

One Reel.

One 50 Saw Gin, built by Daniel Pratt Gin Co., Prattville, Ala.

One Prior Roller Gin.

Wet and Dry Twister, made by the Draper Co., Hopedale, Mass.

One Weeks Banding Machine. (Draper Co.)

From the Whitin Machine Works, Whitinsville, Mass.

One 40 in. R. F. Card.

One Six Head Comber.

One Ribbon Lapper.

Two Ring Spinning Frames.

#### **Knitting Department.**

One Mayo Automatic Seamless Knitting Machine.

One Spring Needle Cut Hose Machine.

One Latch Needle Ribbed Hose Machine.

One Beattie Looper.



GENERAL CHEMISTRY LECTURE ROOM



Two Invincible Automatic Knitting Machines from the E. Jenckes Mfg. Co., Pawtucket, R. I.

The Head House provides space for a complete knitting equipment.

### **The Woolen Spinning Department Includes:**

Wool Scouring Machinery made by C. G. Sargent's Sons, Graniteville, Mass., consisting of:

One Automatic Feeder for scouring bowls.

Two Scouring Bowls, 17 ft. x 24 in.

One Automatic Feeder for Dryer.

One Single Apron Dryer.

One Parkhurst Burr Picker, made by the Atlas Mfg. Co., Newark, N. J.

One Mixing Picker, made by the Davis & Furber Machine Co., North Andover, Mass., equipped with Improved Mixing Picker Feed, and Spencer Oiler, both made by G. S. Harwood & Sons, Boston, Mass.

One set of Woolen Cards, including:

First Breaker, Second Breaker and Finisher, made by the Davis & Furber Machine Co., North Andover, Mass.; this set of cards is equipped with Bramwell First Breaker Feed, made by G. S. Harwood & Sons, Boston, Mass.; Torrance Balling Head and Creel, (made by the Torrance Mfg. Co., Harrison, N. J.) between First Breaker and Second Breaker; Apperly Feed, (made by G. S. Harwood & Sons, Boston, Mass.,) between Second Breaker and Finisher, and Combination Rub Rolls and Apron Condenser, (made by the Davis & Furber Machine Co., North Andover, Mass.,) on Finisher. These cards are for medium and coarse work.

One set of Davis & Furber Woolen Cards, including:

First Breaker, Second Breaker and Finisher. This set of cards is equipped with Bramwell First Breaker Feed, (made by G. S. Harwood & Sons, Boston, Mass.,) Apperly Feed with Kemp Traveller, (made by G. S. Harwood & Sons, Boston, Mass.,) between First Breaker and Second Breaker; Bates Feed, (made by E. V. Bates, Lowell, Mass.,) between Second Breaker and Finisher, and Davis & Furber Double Apron Condenser, on Finisher. These cards are for fine work.





GENERAL CHEMISTRY  
PREPARATION LABORATORY

One Spinning Mule, 120 spindles, made by the Davis & Furber Machine Co., North Andover, Mass.; Bobbin Holders, supplied by American Bobbin Holder Co., W. Medway, Mass.

One Spinning Mule, 120 Spindles, made by Johnson & Bassett, Worcester, Mass.; Bobbin Holders supplied by Murdock & Geb, Franklin, Mass.

One Woolen Twister, 20 Spindles, made by the Davis & Furber Machine Co., North Andover, Mass.

One Roy Grinding Frame, made by B. S. Roy & Son, Worcester, Mass.

Two Roy Traverse Grinders, made by B. S. Roy & Son, Worcester, Mass.

One Entwistle Traverse Grinder, made by T. C. Entwistle Co., Lowell, Mass.

One Sample Mixing Card, made by the Torrance Mfg. Co., Harrison, N. J.

One Complete Set of Carders' Tools, made by W. H. Brown, Worcester, Mass.

#### **The Worsted Spinning Department Includes:**

One 50-inch Double-Worsted Card (4 lickerin,) made by the Davis & Furber Machine Co., North Andover, Mass.

One Doubling Balling Head Gill Box (with double screws) made by Lowell Machine Shop, Lowell, Mass.

One Weigh Gill Box and Creel, made by Lowell Machine Shop, Lowell, Mass.

One Baller, (punch) made by Crompton & Knowles, Worcester, Mass.

One Noble Worsted Comb, made by Crompton & Knowles, Worcester, Mass.

One Finishing Can Gill Box, made by Hall & Stell, Keighley, England.

One Finishing Balling Head Gill Box, made by Hall & Stell, Keighley, England.

The following Drawing, Spinning and Twisting Machinery from Prince Smith & Son, Keighley, England:

One Revolving Creel for 12 Balls.

One Double Head Can Gill Box.

One 2 Spindle Gill Box.

One 2 Spindle Drawing Box.

One 2 Spindle Weigh Box.

One 4 Spindle First Finisher.



DYEING LABORATORY  
SAMPLE PRINTING MACHINE

- One 12 Spindle Dandy Reducer.
- One 12 Spindle Cap Spinner.
- One 12 Spindle Flyer Spinner.
- One 12 Spindle Ring Spinner.
- One 12 Spindle 2 Fold Cap Twister.
- One 12 Spindle 6 Fold Ring Twister.

The following Drawing, Spinning and Twisting machinery from the Lowell Machine Shop, Lowell, Mass.:

- One 2 Spindle Drawing Box.
- One 6 Spindle Second Finisher.
- One 24 Spindle Dandy Rover.
- One 6 Spindle Cone Reducer.
- One 8 Spindle Cone Rover.
- One 48 Spindle Cap Spinner (4 foot end.)
- One 48 Spindle Cap Spinner (5 foot end.)
- One 48 Spindle Boyd Ring Twister.
- One Six Gang Universal Winder, equipped for cones or straight tubes, made by the Universal Winding Co., Boston, Mass.
- One Tape Band Sewing Machine, made by the Singer Mfg. Co., New York.

#### **The Cotton Warp Preparation Department Includes:**

- One Spooler, made by the Lowell Machine Shop, Lowell, Mass.
- One Warper, made by the Lowell Machine Shop, Lowell, Mass.
- One Slasher, made by the Lowell Machine Shop, Lowell, Mass.
- One Beamer, made by T. C. Entwistle, Lowell, Mass.
- One Winder, made by Altemus & Co., Philadelphia, Pa.
- One 400 End Improved Draper Warper.
- Drawing-in Frames, etc.
- 1 Pat. Slasher Press Roll, J. Battles & Co., Lawrence, Mass.
- 1 Pat. Expansion Comb for Warper, T. C. Entwistle Co., Lowell, Mass.

#### **The Woolen and Worsted Warp Preparation Department Includes:**

- One Warp Spooler.
- One Dresser.
- One Reel.
- One Beamer.
- One 48 Spool Creel.

All made by the Davis & Furber Machine Co., North Andover, Mass.



EXPERIMENTAL DYEING LABORATORY



Also a number of hand warping and beaming frames.

**The Power Weaving Department, Includes**

One 24 Line Hercules Braider.

One 12 Line Braider.

One Tubular Braider.

One Sautach Braider, Providence, R. I.

One plain Northrop Loom, made by the Draper Co., Hopedale, Mass.

One Improved Northrop Loom, fine sateen, made by the Draper Co., Hopedale, Mass.

One Northrop Loom with dobby.

One Plain Print Cloth Loom, made by the Whitin Machine Works, Whitinsville, Mass.

One Side Cam Twill Loom, made by the Whitin Machine Works, Whitinsville, Mass.

One Twenty Harness Dobby Loom, made by Whitin Machine Works.

One Five Harness Sateen Loom, made by the Lowell Machine Shop, Lowell, Mass.

1,400 hook Schaum and Uhlinger Jacquard with Lowell Machine Shop Loom. 2 x 2 boxes.

One Plain Print Cloth Loom, made by the Mason Machine Works, Taunton, Mass.

One Harriman Automatic Shuttle Changing Loom.

And the following looms made by the Crompton-Knowles Loom Works, Worcester, Mass., and Providence, R. I.

One Model Dobby Attachments.

One Knowles Gingham Loom, 4 boxes.

One Knowles Fancy Cotton Loom, with 20 harness dobby, 4 boxes, for fancy leno work.

One Knowles Fancy Cotton Loom, with 25 harness dobby,

One Knowles Blanket Loom, with 25 harness dobby, 4 boxes.

One Knowles Gem Loom, 20 harness, 4 x 4 boxes.

One Knowles Worsted Loom, 32 harness 4 x 4 boxes.

Three Knowles Heavy Woolen Looms, 25 harness, 4 x 4 boxes.

One Knowles Fancy Loom, with single lift Jacquard.

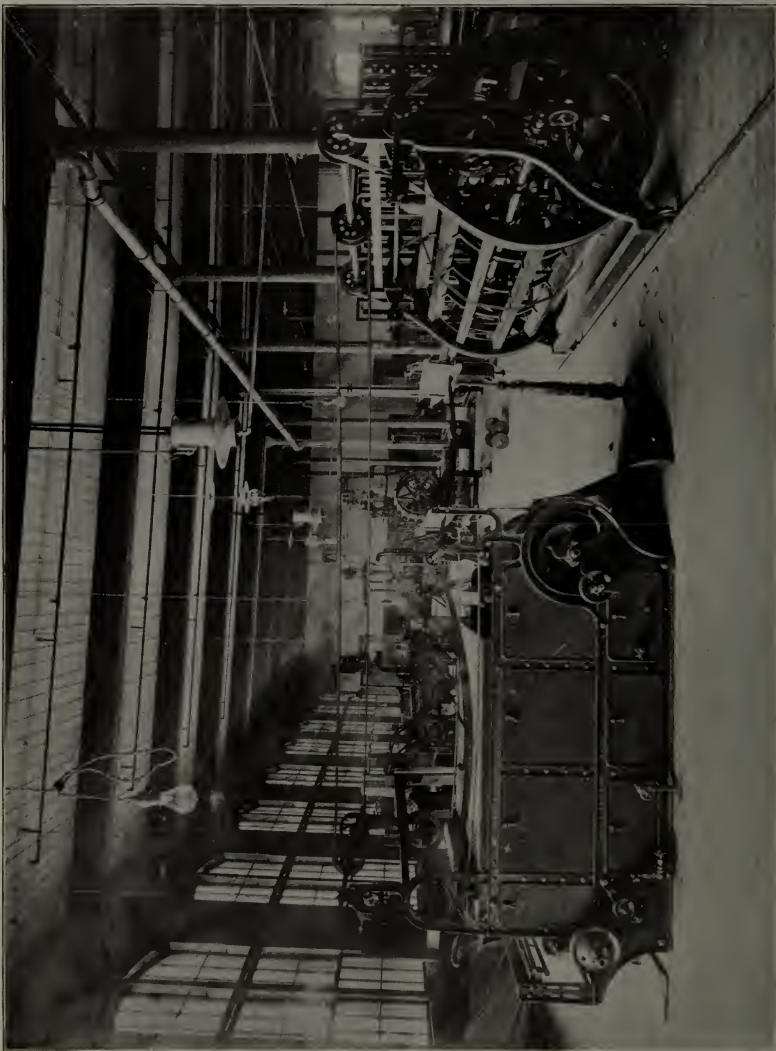
One Knowles Fancy Loom, with double lift Jacquard.

One Knowles Fancy Loom, with Jacquard tied up for leno.

One 1200 Hook Halton Jacquard Head Motion, arranged to be transferred to different looms.

One Knowles Ingrain Carpet Loom, 4 x 4 boxes.





WEAVE ROOM

One Crompton Gingham Loom, 4 x 1 boxes.  
 One Crompton Fancy Loom, 6 x 1, with double cylinder, 20 harness dobbie.  
 One Crompton Fancy Cotton Loom, with single cylinder, 20 harness dobbie.  
 One Crompton Jean Loom.  
 One Stafford 36 inch 20 harness Cotton Loom, Geo. W. Stafford, Readville, Mass.  
 One Stafford Silk Loom.  
 One Crompton Lappet Loom, with 16 harness dobbie.  
 One Crompton Towel Loom, 2 x 1 boxes.  
 One Crompton Ingrain Carpet Loom, 4 x 4 boxes.  
 One Crompton Worsted Loom, 24 harness, 4x4 boxes.  
 One Crompton & Knowles Heavy Loom, 20 harness, 4x4 boxes.  
 One Lewiston Machine Co. Loom, 4 harness, side cam.  
 One Lewiston Machine Co., Bag Loom.  
 One Kilburn & Lincoln Plain Loom.  
 One Jacquard Piano Card Cutting Machine, from John Royle & Sons, Paterson, N. J.  
 One 2,800 hook Halton Tapestry Jacquard.  
 One 800 hook Jacquard, J. Battles & Co., Lawrence, Mass.

#### **Hand Loom Department**

Twelve Hand Looms, 2x3 boxes, with 20 harness dobbie.  
 Eight Hand Looms, 4x4 boxes, with 24 harness dobbie.  
 Six Hand Looms, 3x3 boxes, with 32 harness dobbie.  
 Six Hand Looms, 4x4 boxes, with 30 harness dobbie.  
 Two Hand Looms, with treadles.  
 Two Hand Looms, 4x4 boxes, with 200 hook Jacquard.  
 Two Hand Looms, 3x3 boxes, 200 hook Jacquard.  
 Two Hand Looms, 3x3 boxes, with 600 hook Jacquard.

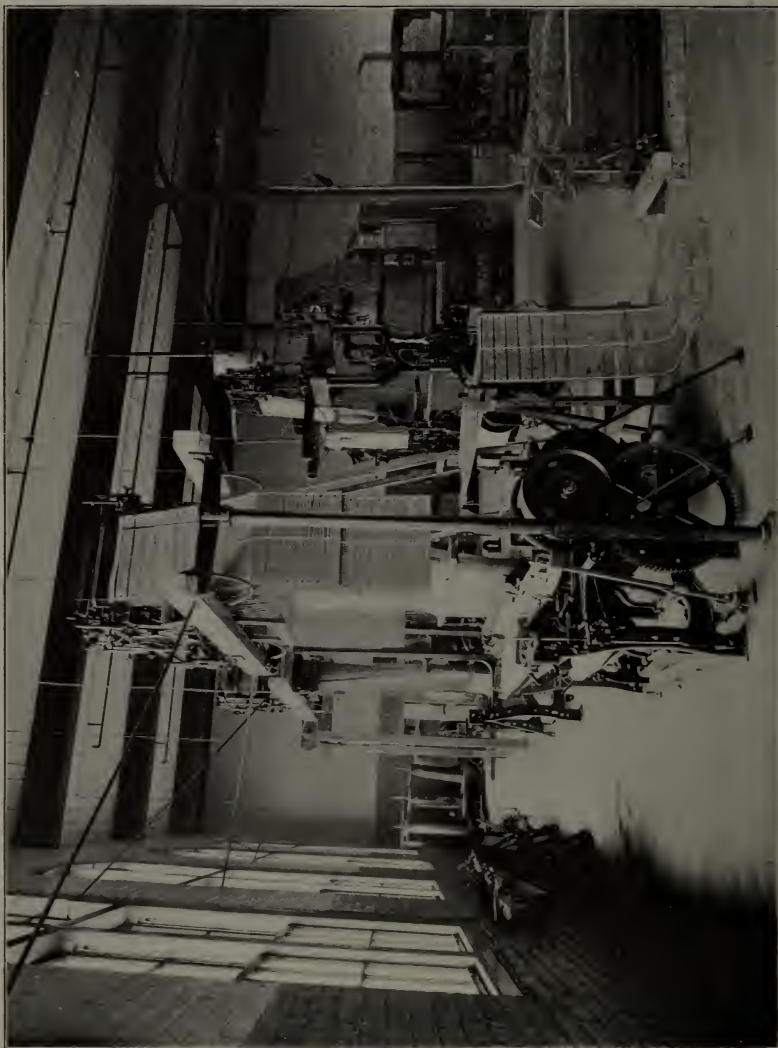
#### **The Silk Preparing Machinery Consists of:**

One Winder.  
 One Quiller.  
 One Warper.  
 One Beamer.  
 One Double Frame.

All made by the Atwood Machine Co., Stonington, Conn.

#### **The Chemical Laboratories are Equipped as Follows:**

The General Chemistry and Qualitative Analysis Laboratory includes:



WEAVE ROOM

One hundred and twenty laboratory desks, each containing a full set of apparatus for the first year's work in chemistry; also gas and water fittings, reagents and sinks.

Four Large Double Hoods.

Two Steam Baths.

#### **The Quantitative Laboratory Includes:**

One Water Distilling Apparatus.

One Steam Drying Closet.

One Large Steam Bath.

One Electrolytic Table.

Five Hoods.

Twenty-six laboratory desks, each fully provided with apparatus.

#### **The Balance Room Contains:**

One Large Christian Becker Analytical Balance.

Three Small Christian Becker Analytical Balances.

One Standing Analytical Balance.

One Eimer & Amend Analytical Balance.

One H. L. Becker's Son & Co. Analytical Balance.

#### **The Combustion Room Includes:**

One Combustion Furnace, 25 burners.

One Lothar Meyer's Furnace for tubes.

One Kerosene Burner Muffle Furnace.

#### **The Microscopical and Volumetric Laboratory Includes:**

Two Benches for volumetric analysis.

Two Benches for microscopical work.

Three Bausch & Lomb Compound Microscopes.

One Nachet et Fils Compound Microscope.

Desks and shelves for the apparatus and reagents necessary for this branch of the work.

#### **The Assistant Instructors' Laboratory Includes:**

One Large Case for chemicals.

One Double Hood.

One Copper Water Bath.

One Soapstone Sink with a drain board.

Benches, desks and complete fittings for water, gas and suction.





WEAVE ROOM

### **The Private Laboratory Includes:**

One Christian Becker Balance.  
One Case for Chemicals and Apparatus.  
Three Laboratory Benches, with necessary fittings.  
One Large Hood.  
One Steam Bath.  
One Experimental Dye Apparatus.  
One Porcelain Sink.

### **The Chemical Lecture Room Includes:**

A lecture table fully equipped with gas, water, sinks, a hood and sufficient apparatus for lecture experiments.

Seats are provided for 80 students, being arranged on a raised floor so that every student has a full view of the lecture table.

### **The Chemical Museum**

This contains various collections of dye stuffs and chemicals for exhibition and for lecture demonstration.

### **Experimental Dyeing Department**

The dyeing laboratory is equipped with individual benches, small dyeing apparatus, reels, balances, apparatus for dye testing, such as frames for exposing dyed material to light, and a complete collection of dyestuff samples and sample cards.

One Small Hydro Extractor, from W. H. Tollhurst & Sons, Troy, N. Y.

Twenty-four Steam Jacketed Experimental Dyeing Machines.

One Drying Chamber.

One Ageing Chamber.

The private dyeing laboratory is well equipped with the necessary apparatus for experimental dyeing and research work.

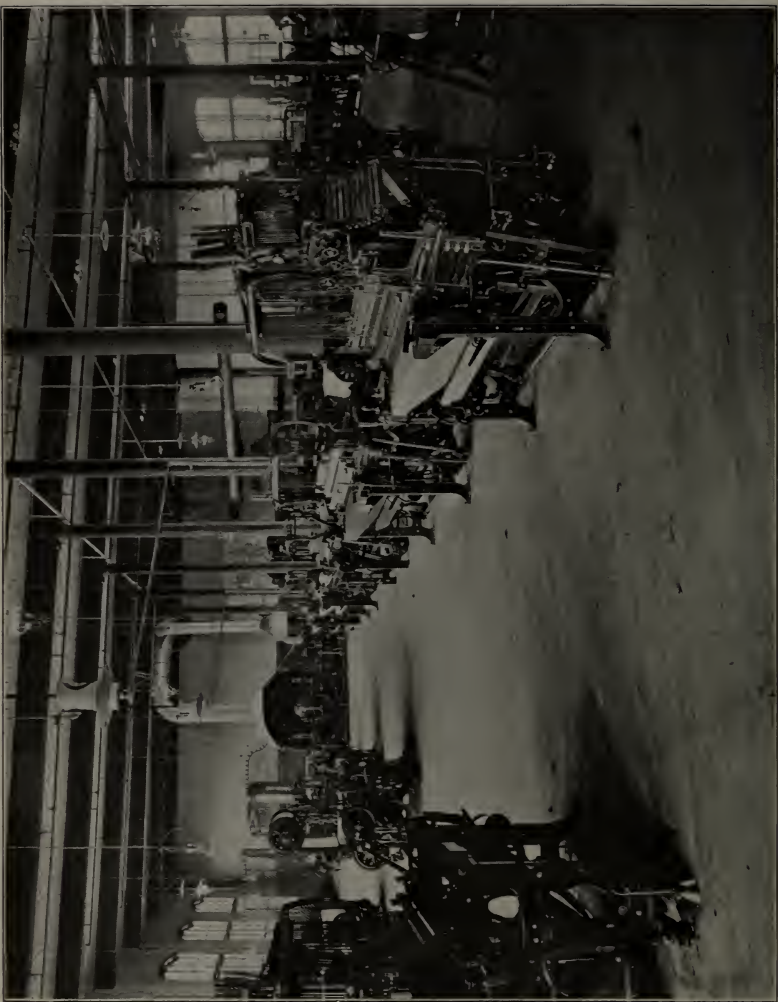
### **Printing Department**

One Calico Printing Machine, made by Mather & Platt, Oldham, England.

One Iron Jacketed Steaming Chamber from A. Edmeston & Son, Salford, England.

One set of Steam Jacketed Copper Kettles.





WEAVE ROOM

### Dyeing and Finishing Departments

- One 2 String Washer, Rodney Hunt Co., Orange, Mass.
- One Rodney Hunt Fulling Mill.
- One Up and Down Wet Gig and
- One Two Cylinder Double Acting Brushing Machine, from Curtis & Marble, Worcester, Mass.
- One Tentering and Drying Machine, made by D. R. Kenyon & Son, Raritan, N. J.
- One 6-4 Double Shear from Parks & Woolson, Springfield, Vt.
- One 6-4 Voelker Rotary Press, Woonsocket, R. I.
- One Sewing Machine, Birch Brothers, Somerville, Mass.
- One Measuring Machine, from Fabric Measuring and Packaging Co., New York, N. Y.
- One Kier, from Atlantic Works, E. Boston, Mass.
- One 4 String Dyeing Machine from Rodney Hunt Machine Co.
- One Mercerizing Machine.
- One Raw Stock Dyeing Machine, Klauder-Weldon Dyeing Machine Co., Amsterdam, N. Y.
- One Yarn Dyeing Machine, Klauder-Weldon Dyeing Machine Co.
- The remaining machinery and apparatus necessary for the complete outfit in dyeing and finishing is to be put in place during the year.

### Physical Laboratory

Through the generosity of a friend of the School a laboratory has been provided with the most approved apparatus for testing the physical properties of all fibres, yarns and fabrics; the equipment includes:

- One Bausch and Lomb D. D. Microscope.
- Two inch, 1 inch, and  $\frac{1}{2}$  inch regular eyepieces.
- Three-fourths inch (photographic,) 2-3 inch, 1-6 inch, 1-12 inch (oil immersion) objectives.
- One Nicol prism polarizer and analyzer.
- One Eye Piece Micrometer.
- One Filar Micrometer, (1 inch equivalent eye piece) for refined diameter determinations.
- One Standard Glass Stage, divided to 1-10 and 1-100 m. m., with corrections as tested against the International m. m.
- Complete outfit for mounting slides.
- Complete outfit for photo microscopy.
- One specially designed single fibre testing machine.



ELECTRICAL ENGINEERING LABORATORY

Camera Lucida.

Microtome Sectioning Outfit.

One Small Skein Testing Machine.

One set Conditioning Ovens for moisture determination.

One Yarn Testing Machine, adjusted to test strength, twist, take up, elasticity, and stretch.

One Hydraulic Cloth Strength Testing Machine.

### **Power, Light, Heat and Ventilation**

Two 100 H. P. Stirling Water Tube Boilers.

One Sturtevant Induced Draft Apparatus, including fan, direct connected to the Sturtevant vertical engine and equipped with two way dampers.

One Sturtevant Smoke Filtering Apparatus.

One Foster Reducing Valve used as automatic pressure regulator for draft engine.

One Locke Steam Pressure Regulator for draft engine.

One Knowles Boiler Feed Pump, 6 in. x 4 in. x 6 in.

One Warren Webster Feed Water Filter, heater and oil extractor.

One Payne 14 in. x 14 in. Automatic High Speed Engine of 125 H. P. and 260 r. p. m.

One 9½ in. x 11¾ in. Nash Gas Engine of 50 H. P. of the three cylinder type, with speed regulating clutch and hit and miss governor.

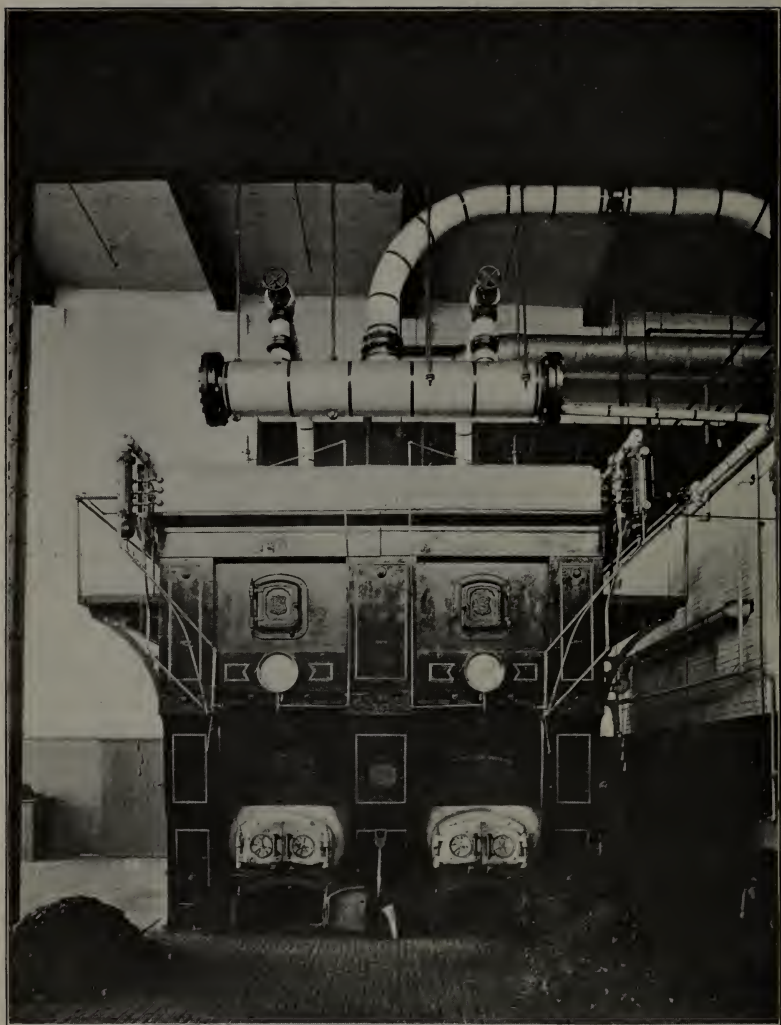
One Motor Driven Air Compressor 5½ in. x 6 in. with a storage tank of 20 cubic feet capacity, 100 lbs. per sq. in. pressure.

One Complete Sturtevant Double Duet System for heating and ventilating Southwick Hall. This apparatus is designed to provide the proper amount of fresh warm air called for by the State law as applied to educational institutions, and includes a 9ft. x 4ft. fan direct connected to the Sturtevant horizontal engine, drip tank and Knowles automatic return pump, 4½ in. x 2¾ in. x 4 in. arranged to deliver either to the feed water heater or to the boilers direct.

One Sturtevant Fan and Heater for Kitson Hall and Falmouth Street Building, direct connected to a Sturtevant inverted engine.

One Cross Oil Filter.

One Complete Moistening Apparatus installed by the American Moistening Co., Boston, Mass., including Knowles triplex



BOILER HOUSE



- 4 x 4 power pump, tank, and 18 moistening heads.
- One Complete Sprinkler System for fire protection, using the Grinnell glass button heads.
- One Bullock 75 K. W. Direct Current Multipolar Compound Generator, wound for 220 volts, over compounded 20 volts from no load to full load and direct connected to the Payne engine.
- One Bullock 30 K. W. Generator of the same type, direct connected to the Nash gas engine. The switch board is arranged so that either unit may be thrown in independently on the power or lighting feeders or the two machines may be run in parallel. The lighting circuits are on the two wire 220 volt system and supply the equivalent of 660-16 candle power lamps.
- Three 24 H. P. Bullock Motors.
- Four 15 H. P. Bullock Motors.
- One 3 H. P. Motor from New England Motor Co.
- One 2 H. P. Motor from New England Motor Co.
- One 250 volt Weston Portable Voltmeter.
- One 250 volt Weston Portable Voltmeter with calibrating coil.
- One 150 ampere Weston Portable Ammeter.
- One Weston Portable Millivoltmeter with 200 milli-volt and 20 milli-volt scales.
- One D'Arsonval Reflecting Galvanometer.
- One Simple Galvanometer.
- One Wheatstone Bridge.
- Two Direct Current Self Feeding Arc Lamps.
- Two Hand Feed Arc Lamps for stereopticons.
- Resistance boxes of various sizes and other apparatus necessary for commercial testing of lamps, motors, etc.
- All of the above apparatus is available for experimental work and affords opportunities for laboratory practice for the classes in mechanical and electrical engineering.

### Athletic Field

Through the generosity of Mr. Frederic Fanning Ayer, the school has been provided with a Campus and Athletic Field of about three acres.

### ADDENDA.

COTTON SPINNING DEPARTMENT.—As this Bulletin goes to press, the School receives word of the gift of One 40 in. R. F. Card from the Saco and Pettee Machine Shops, Newton Upper Falls, Mass.





MECHANICAL DRAWING ROOM

# Day Students

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## Entrance Qualifications

Candidates for admission will be accepted upon presentation of properly vouched certificate showing the completion of a regular four year High School course. For all others, there will be held examinations, as stated in calendar; candidates failing to pass at June examinations will be allowed to try again in September; those who cannot attend the June examinations, may present themselves in September; if conditioned, a further examination will be appointed. Requirements in general will be as follows:

### Arithmetic

Definitions; elementary operations in addition, subtraction, multiplication and division; squares; cubes; square root; interest, discount; fractions, simple and complex; decimals; percentage, allegation; ratio and proportion. Metric System.

### English

The candidates will be expected to correct examples of bad English, for spelling, punctuation, capitalization, grammar and sense; also to write a short composition on a given familiar theme.

### Geography

Location of principal countries, with capitals, large rivers, mountains, etc., noting characteristics of climate, productions and inhabitants. General statements rather than specialization will be sought.

### Algebra

Definitions; fundamental operations, parenthesis, factoring; highest common factor; least common multiple; fractions, simple and complex; simple equations, one or more unknown quantities; involution and evolution; square and cube root; logarithms.

### Geometry

As much plane geometry as is included in any of the generally accepted text books. The student should be familiar with properties of plane rectilinear figures, the measurement of angles, the circle, polygons, etc.



ENGINEERING CLASS ROOM

### **Preparation.**

For those who intend to take Chemistry and Dyeing, physics is almost indispensable. In a preparatory course, particular attention should be given to algebra, geometry, manual training, chemistry, physics (including mechanics, heat, light and electricity), French and German.

### **Advanced Standing**

Candidates who may have received previous training in any of the subjects ordinarily taken in the regular courses may present themselves for examination as per calendar. If a satisfactory rank be attained, they will be given such further work as will be best suited to their advancement.

### **Attendance Card**

At the beginning of each term all students must fill out and file with the Principal on blank forms which are provided, a formal application for such subjects as he may choose, subject to the approval of the Principal. When an attendance card is once approved, no change can be made except through the Principal.

### **Application Blanks**

A blank form of application may be found at the end of this bulletin. This should be properly filled out by all applicants.

### **Fees**

The fee for the day course is \$100 per year for residents of Massachusetts; for non-residents it is \$150 per year.

Three-fifths of the fee is charged for a single term and is payable on or before October 10, the balance on or before February 10, of each year. After payment is made, no fee or part thereof can be returned, except by special action of the Trustees.

Special students pay in general, the full fee, but if a course be taken involving attendance at the school during a limited time, application may be made to the Principal for a reduction.

Students must provide their own books, stationery, tools, etc., and pay for any breakage or damage that they cause. The above fee includes free admission to any of the evening classes in which there is accommodation, should any day student desire to attend.

A deposit of \$15 will be required to cover the cost of breakage in the chemical laboratory, the unexpended balance to be returned to the student at the end of the year.

The fees for the evening classes vary and are indicated elsewhere.

Fees are strictly payable in advance, and no student will be admitted to the classes until his fees are paid and he has filed an attendance card.

### **Payments**

All payments should be made to Wm. W. Crosby, Principal. If by check, remittance from points outside of New England should be in Boston or New York funds.

### **Examinations**

Examinations will be held at the end of each term.

Students who do not show sufficiently satisfactory progress in the final examinations at the end of the first year will not be admitted to the second year classes, and the same applies to second year students with reference to their admission to the third year classes.

Intermediate examinations will be held, which will serve to inform the student as to progress made, or lack of it, and may be appointed at any time.

In general, the examinations will cover the work of the preceding term, but at the end of the third year, candidates for diplomas may be examined on all preceding work.

Daily work and regularity of attendance will also be considered in making up the reports of standing.

Continued or persistent absence (or tardiness) from the classes will be considered sufficient reason to exclude a student from the class.

### **Reports of Standing**

Twice during each term informal reports are sent to students, or to guardians of such as are not of age; and at the end of each term formal reports are made.

### **Thesis**

All candidates for the diploma of the school must file with the Principal not later than May 15, a report of original investigation, or research, written on a good quality of paper, 8x10 inches, with one inch margin at left, and 1/2 inch at right of each page; such thesis to have been previously approved by the head of the department in which it is made.



## **Graduate Course**

Graduates of technical courses of other schools are invited to communicate with the Principal with reference to special courses in the textile studies. Previous training in the engineering branches will usually reduce materially the time necessary to complete any of the courses at this school. The advantages offered to such persons for special research work are unexcelled, and a most profitable course may be arranged.

## **The Regular Courses**

The title of each of the regular courses is an indication of the particular nature of the course, unless it be in the case of Course III. There is a considerable demand for a general textile course in which the whole subject may be treated broadly; this course is organized with this particular object in view, although various options are offered, in which some one branch may be followed at length. Certain general studies are included in each course, in order that in specializing, a too narrow view may be avoided.

## **Special Courses**

While it is always urged that regular courses be followed if possible, there is opportunity to make special arrangements to fit for particular positions, as for example:—yarn mill, weaving special fabrics, designing, etc., and owing to the large number of possibilities, those desiring such courses are invited to correspond with the Principal. See paragraph “Certificate ” below.

## **Diploma**

The diploma of the School is awarded upon the satisfactory completion of a regular course, covering not less than three years, except where entrance is to advance standing. In such cases at least one year's residence will be required.

## **Certificate**

For the satisfactory completion of a three year's course in any special department, the certificate of the School will be awarded; it is possible to complete such a course in less than three years, if the candidate be passed to advanced standing, but at least one year's attendance will be required.



### **Medal of Honor**

The New England Cotton Manufacturers' Association offers annually a medal to that member of the graduating class who shall be selected by a committee of the Association as best fitted to receive it.

### **Conduct**

Day students are expected to attend all lectures, classes and demonstrations of practical work, except when permission to be absent has been obtained from the Principal. In cases of sickness or other unavoidable absence, written explanation must be sent to the Principal. The daily work of the student forms an important part of his record, and no student will be awarded the diploma unless this portion of his record is clear.

Books will be prescribed for study, for entry of lecture notes and other exercises, and will be periodically examined by the lecturers. The care and accuracy with which these books are kept will be considered in determining standing.

Students are required to return to the proper place all instruments or apparatus used in experimental work and to leave all machinery and apparatus with which they may experiment clean and in working order. All breakages, accidents, or irregularities of any kind must be reported immediately to the head of the department, or instructor in charge.

In the cases of either day or evening students, irregular attendance, lack of punctuality, neglect of either school or home work, disorderly or ungentlemanly conduct or general insubordination, will be considered good and sufficient reason for the suspension of a student by the Principal, and for his subsequent removal from the School and forfeiture of all School privileges, if the President of the School so decides.

Apparatus used in the Dyeing or Chemical Laboratory will be provided by the School, but a deposit must be made by the student at the beginning of the term sufficient to cover its cost, and this deposit will be returned to him at the close of the term, subject to such deduction as will reimburse the School for broken or damaged articles.

### **Library**

The School Library is supplied with leading textile books and with works dealing with science, art or industries allied to the textile trades. The leading textile trade papers are kept on file.

## **Sessions**

The regular school sessions will be in general from 9 a. m. till 1 p. m., and from 2.15 to 5 p. m., except Saturdays, when the buildings will be closed in the afternoon.

A tabular view will designate the hours at which the various classes meet. This will be rigidly adhered to and the register will be marked for each lecture or demonstration.

## **General**

Students from a distance, requiring rooms and board in the city, may, if they desire it, select the same from a list which is kept at the School. The cost of rooms and board in a good district is from \$4 per week upwards.

All raw stock and yarn will be provided by the School, and all the productions of the School remain, or become, the property of the Trustees, except by special arrangement, but each student will be allowed to retain specimens of yarn or fabrics that he has produced, if mounted and tabulated as prescribed by the Principal, and facilities will be given for the preparation of a collection of such fabrics as are produced in the School, with all the instruction for their manufacture. It is understood that the Trustees may retain in the School such other specimens of student's work as the Principal may determine.

Prospective students who are desirous of arranging special courses by omitting a portion of one course and adding a portion of another, are invited to communicate with the Principal.

An additional entrance examination to suit the convenience of students from a distance (out of New England,) will be arranged.

Lock boxes will be provided for the use of students, sufficiently capacious to contain clothing, books and tools. A deposit of 25 cents will be required, which will be returned to the student upon the surrender of the locker key.

No books, instruments, or other property of the School will be loaned to the students, or allowed to be removed from the premises.

## **Materials**

Students must purchase such tools, instruments, text books, and apparatus as may from time to time be recommended by the head of each department, and the cost of these for day students will be from \$15 to \$20, and for evening students from \$1 upwards, according to the subject studied.

### **Awards**

Gold Medal Paris Exposition, 1900, for general excellence. A Special Medal Merchants and Manufacturers Exhibition, Boston, 1900. The Pan American Medal awarded to the School, 1901.

### **Bulletins and Catalogue**

All students registering and paying the regular fee for the course selected will be entitled to the Bulletins and Catalogue when issued.

Sample copies may be had on application to the Principal.

# Courses of Instruction

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## DAY CLASSES

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For details of the several subjects see subsequent pages, beginning with page 58

### FIRST YEAR — FIRST TERM

( *Common to all courses* )

Elements of Mechanism  
Mechanical Drawing  
Mathematics

Hand Looms  
General Chemistry  
Freehand Drawing

Decorative Art

Options :

German and Spanish

### Course I. — Cotton Manufacturing

#### FIRST YEAR — FIRST TERM

( *Common to all courses, see above* )

#### FIRST YEAR — SECOND TERM

Cotton Fibre  
Microscopic Examination of Fibre  
Design Construction  
Cloth Analysis  
Elements of Mechanism  
Mathematics

Cotton Manipulation  
Cloth Construction  
Hand Looms  
General Chemistry  
Freehand Drawing  
Decorative Art

Mechanical Drawing

Options :

German and Spanish

#### SECOND YEAR — FIRST TERM

Cotton Spinning	Mechanical Engineering
Machine Drawing	Cloth Analysis
Textile Chemistry and Dyeing	Cloth Construction
Designing	

#### SECOND YEAR — SECOND TERM

Cotton Spinning	Mechanical Engineering
Machine Drawing	Power Weaving
Textile Chemistry and Dyeing	Designing
Cloth Analysis	Electricity
Cloth Construction	

#### THIRD YEAR

Weaving	Designing
Knitting Machinery	Mill Engineering
Thesis	Cloth Construction
Cloth Analysis	Hand Looms

### Course II. — Wool Manufacturing

#### FIRST YEAR — FIRST TERM

(Common to all courses, see page 55)

#### FIRST YEAR — SECOND TERM

Wool Fibre	Woolen Spinning
Microscopic Examination of Fibres	
Design Construction	Cloth Construction
Cloth Analysis	Hand Looms
Elements of Mechanism	General Chemistry
Mechanical Drawing	Freehand Drawing
Mathematics	Decorative Art

#### SECOND YEAR — FIRST TERM

Worsted Spinning	Applied Mechanics
Machine Drawing	Designing
Textile Chemistry and Dyeing	Cloth Analysis
Cloth Construction	

# SECOND YEAR — SECOND TERM

Worsted Spinning  
Machine Drawing  
Textile Chemistry and Dyeing  
Cloth Analysis

Mechanical Engineering  
Power Weaving  
Designing  
Electricity

Cloth Construction

# THIRD YEAR

Power Weaving  
Knitting Machinery  
Thesis  
Cloth Construction

Designing  
Mill Engineering  
Hand Looms  
Cloth Analysis

# Course III — Designing

## FIRST YEAR — FIRST TERM

*(Common to all courses, see page 55)*

## FIRST YEAR — SECOND TERM

Design Construction  
Cloth Analysis  
Design Sketching  
Mechanical Drawing  
Mathematics

Elements of Mechanism

Cloth Construction  
Hand Looms  
Freehand Drawing  
General Chemistry  
Decorative Art

Options:

Woolen and Worsted Spinning

Cotton Spinning

## SECOND YEAR

Design Construction  
Cloth Analysis

Design Sketching and Jacquard Work

Decorative Art

Textile Chemistry and Dyeing

Cloth Construction  
Hand Looms

Weaving

Mechanical Engineering

Options:

Woolen and Worsted Spinning

Cotton Spinning

## THIRD YEAR

Designing — Advanced Work  
Thesis  
Cloth Construction

Hand Looms

Weaving

Decorative Art

Cloth Analysis

Options:

Mill Engineering

Strength of Textile Materials



## Course IV — Chemistry and Dyeing

### FIRST YEAR — FIRST TERM

*(Common to all courses, see page 55)*

### FIRST YEAR — SECOND TERM

General Chemistry  
Stoichiometry  
Elements of Mechanism  
Cloth Analysis  
Mathematics

Qualitative Analysis  
Mechanical Drawing  
Designing  
Hand Looms  
German

Cloth Construction

### SECOND YEAR

Textile Chemistry and Dyeing  
Industrial Chemistry  
Applied Mechanics

Advanced Inorganic Chemistry  
Organic Chemistry  
Electricity

Options:

Designing

German

Weaving

### THIRD YEAR

Quantitative Analysis

Advanced Textile Chemistry and Dyeing

Industrial Chemistry

Dye Testing

Physical Chemistry

Microscopy

Thesis

Options:

Weaving

Mill Engineering

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## Cotton Spinning Department

### COTTON

Lecture Course :

Ancient History.

Structure of Fibres.

Botanical Varieties — Their classification and characteristics.

Commercial Varieties, classification, characteristics and adaptatives.

Methods of Cultivation.

Ginning — Roller and Saw Gins.

Baling — Various forms of Baling Presses and their products, characteristics of each.

Mixing — Per cent. grade, variety and color mixtures.

### PICKING

Construction and operation of various machines used in the Picking process, and calculations connected with same.

Bale Breaker, Automatic Feed, Opener, Breaker, Intermediate and Finisher Pickers.

Cleaning Trunks, Evener Motions, Beaters, Regulation of Air Drafts, etc.

## CARDING.

- Principles of Carding.
- Construction and operation of various forms of Cards.
- Top Flat Cards.
- Revolving Flat Cards.
- Card Clothing, Grinding, Setting, Drafts, Speeds, and Production and Calculations connected therewith.
- Principles of Waste Carding.
- Defects in operation and in quality and amount of production of the foregoing machinery and remedies.
- Practical illustrations of principles taught and analysis of product.

## DRAWING.

- Theory of Drawing.
- Effect of Doublings.
- Construction and operation of the Railway Head.
- Evener Motions.
- Stop Motions.
- The Drawing Frame.—Varieties and Details of Construction.
- Stop Motions.—Mechanical and Electric, Rolls—Common and Metallic and peculiarities of each.
- Roll Setting, Proportioning of Drafts, Condensing.
- Operation, Adjustment and Care of Drawing Machinery.
- Speeds, Drafts and Production and Calculations for each.

## ROVING PROCESSES.

- The development of the Fly Frames.
- Mechanical construction and operation of the Stubber.
- Intermediate, Fine and Jack Fly Frames, and features of each.
- Explanation of Differential Motions, Builder Motions, Reverse Motions.
- The functions and development of the Cones.
- Draft, Twist, Tension, Lay and Taper regulation and the effect of each and calculations for same.
- The Reeling, Weighing and Numbering of Roving.
- Space, Traverse, and length of machines of the several Roving Processes.
- Defects in Adjustment, Operation and Product of Roving Machinery, and the remedy for those defects.
- Practical operation of the machinery illustrative of instruction given.

## SPINNING.

- Classification of Yarns in regard to material, varieties, uses, twist, etc.
- Reeling, Weighing and Numbering of single and ply Yarns.
- Comparison of Throstle, Ring and Mule Spinning.
- Construction and operation of Ring Spinning Frames.

Twist.—Amounts for warp, filling, hosiery yarns and ply yarns.  
Hard and Soft. Regular and Reverse.  
Comparisons of single and double roving in Spinning.  
Consideration of Spinning Frame details. Spindles, Rings, Separators, Builders.—Warp Filling and Combination.  
Calculations for Speed, Drafts, Twists and Production.  
Twisting and Fancy Yarns Loop, Nub, Splash, etc.

### COMBING.

Consideration of the Combing operation and preparatory machines.  
Sliver Lap Machine.  
Ribbon Lapper.  
Comber.—Construction, Operation, Settings, Timings, Adjustment.  
Per cents of Noil.  
Calculations in regard to Drafts, Speeds and Production.  
Practical application of principles taught.

### MULE SPINNING.

The development of the Throstle, Spinning Jenney and Mule.  
Construction and operation of the Mule.  
Details of operation, Drawing, Twisting, Backing off, Winding, Re-engaging.  
Details of construction.—Builder Motion, Quadrant, Roller Motion, Nosing Motions, Jacking Motion, etc.  
Calculation in regard to Speeds, Draft, Twist, Drag and Production.

### ORGANIZATION.

Figuring of "Program" of Doublings and Drafts, throughout the entire yarn manufacturing process, for the production of different varieties and numbers of cotton yarns.  
Calculations for Schedules of Machinery required for the production of different amounts of various Yarns.  
The economic arrangement of Machinery.  
Powers required for various Machines, etc.  
Knitting.  
Construction and operation of Web Machines, Rib Machines, Loopers, in the production of plain hosiery.  
List of machinery adapted for different purposes in Cotton Mill Work.  
Layout of Machinery for different processes.

# Woolen and Worsted Spinning Department

## WOOLEN SPINNING.

Raw Materials.

Animal Fibres:—Wool, Silk, Mohair, Alpaca, Vicugna, Cashmere, Camel Hair, etc.

Vegetable Fibres:—Cotton, Flax, Hemp, Jute, Ramie.

Wool Substitutes:—Noil, Shoddy, Mungo, Extracts, Flocks.

Waste Products manufactured on Woolen Machinery:—

Cotton Waste, Linters, Flax, Hemp, and Jute Waste.

Sources of supply and relative values of above.

Chemical and Physical properties and composition.

Microscopical examination.

## WOOL FIBRE.

Physical and chemical structure—Difference between wool, hair and fur—Physical properties, Strength, Elasticity, Curl, Lustre, etc.

Felting Property—Hygroscopic Property.

Structure and cause of Kemps.

Definitions of trade terms:—Picklock, XXX, XX, X,  $\frac{1}{2}$  Blood,  $\frac{3}{8}$  Blood,  $\frac{1}{4}$  Blood, Delaine, Braid, etc.

Pulled Wools—Their uses and classification.

## WOOL SORTING.

Difference between Sorting and Grading,—Sorting and Blending.

Judging Spinning Qualities.

Estimating Shrinkage.

Definitions of trade terms—Cots, Hog, Shurled Hogget, Wether, Fribs, Paint, Stain, Shoulder, Cast, etc.

The practical sorting will extend over two and one half school years and will be individual instruction averaging two hours per week.

## WOOL SCOURING.

Object of Wool Scouring.

Composition of Yolk and Suint.

Cholesterol and Lanolin.

Materials used as Detergents.

Emulsion Process:—Use of Soda, Potash, Hard and Soft Soaps.

Manufacture of Scouring Soaps with tests for impurities.

Water in Wool Scouring with tests for hardness, etc.

Effect of heat on Wool Fibre with proper heat of scouring liquor.

Recovery of potash salts and wool fat from waste scouring liquor.

The Solvent process—Degreasing Wool, with Naphtha.

Construction and use of Scouring Machines and Rinse Boxes with Speeds, Adjustments and Productions.

Construction and use of Dryers, Table and Artificial.  
Effect of heat on Lustre; proper heat for various classes of Wool:—  
(Braid, Botany, Mohair, etc.)

### CARBONIZING.

Object of Carbonizing.  
Carbonizing Wool, Noils, Burr Waste, Rags, etc.  
Carbonizing Agents:—Sulphuric Acid, Aluminium Chloride, etc.  
Hydrometers.  
Strength of Carbonizing Agents.  
Carbonizing with Acid Gasses.  
Neutralizing.

### BURR PICKING.

Object of Burr Picking—What wools are Burr Picked and why they are not Carbonized.  
Construction and Use of the several Kinds of Burr Pickers.  
Adjustments, Speeds and Production of same.

### MIXING AND OILING.

Object of Mixing. Laying down lots.  
Mixing Different colors of Wool.  
Mixing Wool with Cotton, Shoddy, Noils, etc.  
Object of Oiling—Discussion of various Kinds of Oils used, Olive Lard, etc.  
Oil Testing, Viscosity, Flashing Point, etc.  
Manufacture of Emulsions.  
Construction and Use of Automatic Oilers, Feeds and Pickers.  
Speeds, Productions and Calculations for cost of Lots when materials of different values are used.

### CARDING.

Principles of Carding.  
Functions of various parts:—Feed Rolls, Lickerins, Tumblers, Workers, Strippers, Cylinders, Fancies, Dickies, Doffers, etc.  
Construction of various parts.  
Direction of Revolution and Speeds.  
Card Clothing—Construction and uses of the various Kinds of Backing: Leather, Flexifort, etc.—The several Kinds of Wire:—Garrett, Metallic, Convex, Lickerin, etc.  
The "Counts and Crown" method of counting Card Clothing.  
Card Adjusting and use of Card Sets.  
Clothing the Card.  
Card Grinding and Grinders, Solid Roll, Traverse, Screw and Chain.

### WOOLEN CARDS.

Construction and use of the First Breaker, Second Breaker and Finisher.

Various methods of Coupling Cards.

Card with Breast.

Woolen Card Feeds.—Object, Construction, and use of Automatic Feeds for First Breaker, Bramwell, etc.

The Construction and use of the several Kinds of Automatic Feeds for Second Breaker and Finisher, Apperly, Torrance Balling Head and Creel, Bates, Kemp, Scotch, etc.

Condensers, Rub Roll, Combination, Double Apron, etc.

Calculations for Proper Weight of Roving, Speeds, Productions, etc.

**Sample Carding.**—Each Student is required to make at least twenty Sample Mixes combining different colors and grades of Stock and to Felt and Mount the same. Part of the Carding to be done by Hand Cards and part on the Torrance Sample Mixing Card.

### WOOLEN MULE.

Principles of Spinning. History and development.

Hand Jack, Self-operating and Self Acting Mules. The Mule-head.

Method of Driving the various parts, Rolls, Spindles, Carriage, etc.

Backing-off. Winding Mechanism.

Study of the Quadrant and Builder-rail. Regulation of the Fallers.

Double Spinning. Twisting on Mule and on Woolen Twister.

With the above lectures will be given all the necessary calculations and actual practice on the various machines.

### TOP MAKING.

**Carding and Preparing**—The principles of Worsted Carding—Types of Worsted Cards, Double Cylinder Lickerin, Breast, etc.

Speeds, Settings, Feeds, Adjustments, Productions.

**Preparing**—Differences between Carding and Preparing—What Wools are Prepared and why they are not Carded. The use of Emulsions. A Set of Preparers. The calculations for Drafts on any Gill Box. The Clough Gill Box.

The proper Drafts in Preparing—Adjustments, Speeds, Productions, Calculations, etc.

**Gilling after Carding**—Number of Doublings, etc.

**Combing**—The principles, history and development of Worsted Combing.

Combing on the Noble and Lister machines.

Calculations for Draft—Settings, Speeds, Productions, etc.

Per Cents. of Noil.

**Gilling after Combing**—Proper Drafts and calculations for Doublings.

**Back Washing**—The object and nature of the process—Back Washing Liquors, composition, Heat, etc.

The Hygroscopic property of Wool—Conditioning of Tops—Top Mixing.

### WORSTED DRAWING.

**Open Drawing or Bradford System**—The Principles of Drawing. Numbers of Operations for different Counts of yarn. The use of



Logarithms in Drawing Calculations Study of the Drag—Calculations for Drafts and Twists—Proper Ratch.

The functions of the Weigh Box.

Measuring Stop Motions, Candle Stick, Side Knock-off, etc.

Calculations for length.

Construction and use of Guage Points or Constants.

Effect of Doubling.

The Dram and Hank Systems for numbering Roving.

**Cone Drawing**—The object and use of Cone Drawing—Differential Motions—Builder Motions—Calculations for Draft—Twist—Tension and Lay—Adjustment, Speeds and Productions.

**French Drawing**—The principles and use of French Drawing—Functions of the Porcupine. The principle of Condensing—Manufacture of Merino Yarns.

### WORSTED SPINNING.

The Principles of Spinning. Calculations for Draft and Twist—Spinning on the Cap—Flyer and Ring Frames—The Scaife Builder Motion—Drag in Bradford System of Spinning—The use of Straight Conical and Bell Mouthed Caps. Top Roll, Single and Double Covered, Iron and Wood.

Types of Frames, Leicester and Illingworth; Speeds, Productions, etc.

Principles of Worsted Mule Spinning.

### WORSTED TWISTING.

Principles of Twisting, Reeling, Weighing and Numbering of Single and Ply Yarns, Twisting on Cap, Flyer and Ring Frames—Calculations for Twist—Twist testing—Trap Twisters—Effect of direction of Twist; Speeds, Productions, Yarn Testing, etc.

The true difference between Woolen and Worsted Yarns. Layout of Machinery for different classes of Yarns—Power required for different Machines—Cost of Machinery and approximate labor cost of each Department, Sorting, Scouring, Carbonizing, Picking, Carding, Combing, Drawing, Spinning, Twisting, etc. for various classes of Yarns, Carpet, Braid, Botany, etc.

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## Designing Department

### GENERAL COURSE.

#### First Year.

1. Course of Lectures on cloth construction and designing in Cotton, Woolen, Worsted, Silk, Linen, etc.

Classifications of fabrics.

Plain fabrics and fabrics on a plain cloth basis.

Names and explanations of different parts of cloth and terms applied to weaves, etc. Point or design paper.

Methods of representing weaves, Explanation of harness and chain drafts, etc., on paper. drafts.

Twill cloth and combination of Broken twills.  
same. Plain and irregular ribs.

Sateens. Oblique rib weaves.

Plain and Fancy basket weaves. Corkscrew twill weaves.

Figured weaving on plain ground. Combination of weaves.

Colored goods, stripes. Diapers, coatings, trouserings.  
Checked goods.

2. Practical work and lessons on cloth analysis and reproduction of fabrics, of planning patterns, drafts, etc., on paper, including yarn and cloth calculations, as below.

3. Practical work on hand looms, putting into operation the principles taught in the foregoing course.

Yarn and cloth calculations.

4. The uses of textile calculations, methods of naming or counting. International System of counting yarns.

Comparative calculations for converting one system of yarns into that of another.

Calculations for folded or ply yarns.

Calculations to find weight, count or length of warp, from given data.

Calculations for reeds.

Calculations for harness, straight, centered, or pointed draft.

Calculations for harness, spaced and in combinations.

Calculations for shrinkage, or contraction.

Calculations for quantities of material required to make plain and striped warps.

Calculations for quantities of material required to make plain and checked fabrics.

Calculations to find the number of ends per inch in order to use a given weight of warp, also picks per inch to use a given weight of filling.

Calculations on the proportioning of fabrics.

Practical lessons in color effects.

Combinations of colored threads.

Color definition.

Color nomenclature.

## Second Year.

Lecture Course:	Double and Triple Cloths.
Construction of Cloth.	Cotton Velvets.
Cloth made with or ornamented by extra warp.	Corduroys.
Backed Cloths.	Cotton Pile fabrics, cut and uncut.
	Color definition.

Piques.	Color and color effects.
Marseilles Quilting.	Color nomenclature.
Fancy Woolen Cassimeres.	Chinchilla.
Figured Matellasses.	Crepes.
Figured Blankets.	Lined Work.
Shawls.	Trouserings, Suitings and Coat-
Balance of cloth.	ings.
Cloth made with or ornamented	Worsted and Mohair Mantle
by extra filling.	Cloths.
Cotton, Fancy Sateen Stripes.	Carriage Robes.
Cotton Plushes.	Figured double Plain.

#### Reversibles.

Practical Work and lessons on cloth analysis and reproduction of fabrics, and on planning patterns, drafts, chains, etc., on paper, including all necessary calculations.

Amount of material required for laying out lots for mixes and twisted yarns.

Amount of material used in the construction of fabrics, analysis to consist of Cotton Dress Goods, Gingham and Fancy Weave Dress Goods.

Fancy Woolen and Worsted Cassimeres.

Woolen and Worsted Suitings. Woolen and Worsted Tricots.

Overcoatings.

Double Cloth and Ingrain Carpets

Practical work on hand looms, putting into operation the principles taught in the foregoing course.

### Third Year.

#### Lecture course:

Cotton Gauze.

Cotton Leno.

Cotton Lappet.

Jacquard Designing.

Casting out.

Distribution of Patterns.

Determination of areas occupied by the figures.

Jacquard figures formed with warp.

Jacquard figures with filling.

Figures not square.

The principles of designing, cloth structure and coloring best adapted to each of the above fabrics.

Cloth formed by the combination of Jacquard gauze and fancy harness weaves.

Jacquard pile and ordinary weaves.

Special designs for Jacquard gauze, and pile fabrics.

Vestings, Golfings, Lappet.

#### Analysis.

The Structure and analysis of all descriptions of compound fabrics, viz:—backed, double, and various types of Jacquard figured fabrics, especially applicable to the Cotton and Worsted industries.

The cost of mixings and blends.

The cost of ply yarns.

Metric System.

Practical work on hand looms, original designs, and putting into operation the principles taught in the foregoing course.

## Decorative Art Department

As a knowledge of the principles of design decoration and color is necessary to the success of the textile industry, the Department of Decorative Art has been formed to fill this need and is included in the regular course.

It will include the following:—

The Theory of Color.

The value of color.

The relation of various colors and their effect upon each other.

Harmony, contrast, analogy.

This will also include the making of diagrams and color charts illustrating these principles, and the matching of colors.

The principles of Design.

The study of the elements, and characteristics of design.

The study of geometric conventional and naturalistic forms, and adaption of these forms to the construction of design.

Diaper ornament, repeats and the principles of geometric basis for the same.

Lectures on Ornament.

In connection with the above; lectures are given on the History of Ornament and its bearing on modern art, illustrated by stereopticon and colored plates.

### DECORATION

#### Class in Drawing, Painting and Composition.

Special arrangements have been made to form classes in freehand drawing and decoration, for the purpose of giving the students general instruction in the theory and practice of decorative art, the instruction afterward to be devoted to the special branch the student desires to follow. The school will thus fulfill the object of preparing the student in practical designing in any of the branches of decorative art, with special regard to fabrics.

The class in decoration and design is for the purpose of teaching the principles that enter into every species of design and while it is intended especially for fabrics, Jacquard, damasks, carpets, table-cloths, etc., it is equally applicable to any branch of Decorative Art, and would include the designing of wall paper, book covers, silver, interior decoration, etc.

This class will be for the benefit of those wishing to become painters, decorators or illustrators.

In this class drawing, painting and composition will be taught, and later, should the size of the class warrant it, drawing from the model will be introduced.

This class will be modelled after the Julian Academy of Paris.

Professor George's long experience abroad and in years of teaching in Boston makes this an exceptional opportunity for the students wishing to avail themselves of it.

The class will be session every day from 9 to 12 and 2 to 4, except Saturday, when the building will be closed in the afternoon.

## Chemistry and Dyeing Department

The regular course in Chemistry and Dyeing for day students extends through three entire school years, and is especially recommended to those who intend to enter any branch of textile coloring, bleaching, or the manufacture or sale of the various dyestuffs and chemicals used in the textile industry.

In addition to acquiring a thorough knowledge of the principles of all branches of dyeing, printing, bleaching, etc., the student by application, study, and conscientious performance of all the prescribed laboratory and practical work, should become efficient in the subject of Textile Chemistry, and the methods of testing the various dyestuffs, mordants, etc.

### GENERAL CHEMISTRY.

This subject is required of all students taking the regular course in Chemistry and Dyeing and all others intending to take up the study of Textile Chemistry and Dyeing later.

It will include lectures, recitations, and a large amount of individual laboratory work upon the following subjects, and will extend through one entire school year:—

#### **Chemical Philosophy.**

Chemical action, chemical combination, combining weights, atomic weights, chemical equations, acids, bases, salts, Avogadro's law, molecular weights, formulas, valence, periodic law, etc.

#### **Non-Metallic Elements.**

Study of their occurrence, properties, preparation, chemical compounds, etc.

#### **Metallic Elements.**

Study of their occurrence, properties, metallurgy, chemical compounds, etc.

#### **The Hydrocarbons and their derivatives.**

Study of their occurrence, properties, preparation, uses, etc.

#### **Qualitative Analysis.**

Before the completion of the course, the students will take up as thoroughly as the time will permit, the qualitative detection of the more common metals and non-metals, with practical work. This work will include the qualitative analysis of at least 80 solutions or solids.

### QUALITATIVE ANALYSIS.

Qualitative Analysis will be studied by all regular students during the second term of the first year. The work will be based upon A. A. Noyes' Qualitative Chemical Analysis and will consist of one lecture, one recitation, and not less than five hours laboratory work per week. The student must become familiar with the separations and the detections of the common metals and acids by the analysis of a satisfactory number of solutions, salts, alloys, pigments, etc. At intervals during the term, short laboratory tests will be given as well as the regular written examinations.



No pains will be spared to make the course as valuable to the student as possible and to encourage only thorough and intelligent work.

Students taking Course IV will be required to work in the laboratory not less than twelve hours per week and when sufficiently advanced, will take up the examination of various products with which the textile chemist must be familiar, such as testing mordanted cloths, pigments, and the various dyeing reagents.

### **STOICHIOMETRY.**

This subject will be taken up by the chemistry and dyeing students during the second half of the first year.

The course will include a brief study of hydrostatics and the different methods of finding the specific quantities of solids and liquids. The application of the metric system will be thoroughly taken up, and problems will be worked by the students involving the expansion and contraction of gases, determination of empirical formulae, combining volumes of gases, quantitative analysis, etc.

### **TEXTILE CHEMISTRY AND DYEING.**

Under this head is included first the lecture course in Textile Chemistry and Dyeing, which is taken by all regular diploma students, and second the laboratory and practical work course which will be taken by the regular Chemistry and Dyeing or Course IV students.

#### **Outline of Lecture Course.**

##### **Technology of Vegetable Fibres.**

Cotton, Linen, Jute, Hemp, China grass, etc. Chemical and physical properties, chemical composition, microscopical study, action of chemicals, acids, alkalies, heat, etc.

##### **Technology of Animal Fibres.**

Wool, Mohair, Silk, etc. Chemical and physical properties, chemical composition, microscopical study, action of chemicals, acids, alkalies, heat, etc.

##### **Operations Preliminary to Dyeing.**

Bleaching of cotton and linen, wool scouring, bleaching, fulling and felting of wool, carbonizing, silk scouring and bleaching, action of soap.

##### **Water and its Application in the Textile Industry.**

Impurities present, the methods of their detection, their effect during different operations, and methods for their removal or correction.

##### **Mordants and other Chemical Compounds used in textile coloring not classified as dyestuffs.**

Theory of mordants, their chemical properties and their application, aluminum mordants, iron mordants, tin mordants, chromium mordants, organic mordants, tannin materials, sulphated oil, fixing agents, leveling agents, assistants, etc.



### **Theory of Dyeing.**

Chemical, mechanical, solution, etc.

### **Natural Coloring Matters.**

Origin, properties, application of indigo, log-wood, catechu or cutch, Brazil wood, cochineal, fustic, tumeric, madder, quercitron bark, Persian berries, etc.

### **Artificial Coloring Matter.**

General discussion of their history, nature, source, methods of manufacture, methods of classification, and their application to all fibres.

Special study of:—

Basic Coloring Matters.

Phthalic Anhydride Colors, including the eosins, phloxines, etc.

Acid Dyestuffs.

Direct Cotton Colors.

Sulphur Colors.

Mordant Acid Colors.

Insoluble Azo Colors, developed on the fibre.

Alizarine Colors, including other artificial coloring matters requiring a metallic mordant.

Reduction Vat Colors.

Aniline Black, artificial indigo, and other artificial dyestuffs not coming under the above heads.

### **Machinery Used in Dyeing.**

A certain amount of time will be devoted to the description of the machinery used in the various processes of textile coloring and this will be supplemented as far as possible by the use of charts, diagrams, lantern slides, etc.

### **Outline of Laboratory and Practical Work.**

Besides lectures and recitations upon this subject, those taking the regular day course in Chemistry and Dyeing will be required to do at least fifteen hours per week of practical laboratory work. By the performance of careful and systematic experiments the student will learn the nature of the various dyestuffs and mordants, their coloring properties, their action under various circumstances and the conditions under which they give the best results. The more representative dyestuffs of each class will be applied to cotton, wool and silk, and each student will be obliged to enter in an especially arranged sample book, a specimen of each of his dye trials with full particulars as to conditions of experiment, percentage of compounds used, time, temperature of dye bath, etc.

For convenience and economy most of the dye trials will be made upon small skeins or swatches of the required material, but from time to time students will be required to dye larger quantities.

By the use of a small printing machine the principles of calico printing, and with the introduction of dyeing machines, vats, etc., the practical side of the subject will be studied, and it will be the constant endeavor of those in charge, to impart such information of a theoretical and scientific character as is usually difficult to obtain in a dyehouse.

## **PHYSICAL CHEMISTRY.**

This subject will be studied during the third year.

It will include the principles of calorimetry, specific heat, vapor density, the various methods of determining molecular weights, laws of solution, electrolytic dissociation, theories of precipitation, thermochemistry, surface tension, etc. The student will be required to work out a large number of problems introduced by the subject.

## **ADVANCED INORGANIC CHEMISTRY.**

The whole subject of inorganic chemistry will be reviewed during the second half the second year, and many advanced topics will be introduced which were necessarily omitted from the first course in General Chemistry.

## **ORGANIC CHEMISTRY.**

This subject, which was introduced during the latter part of first year general chemistry, will be continued during the whole of the second year as a special subject. The study will be taken up in a thorough manner and by the end of the year the student will understand the composition of the important artificial dyestuffs and the equations representing the reactions involved in their manufacture.

It will include lectures, recitations and laboratory work.

## **INDUSTRIAL CHEMISTRY.**

This subject will be taken up during the third year, particular attention being paid to those branches which are of special interest to the textile chemist, as oils, soaps, the gas and coal tar industry, building materials, and the manufacture of the important chemical compounds, acids, alkalies, bleaching powder, various mordants, etc., on a large scale.

The course will be illustrated as far as possible with the experiments, specimens, diagrams, and charts, and the students will be given an opportunity to visit some of the industrial establishments in the vicinity of Lowell and Boston.

## **ADVANCED TEXTILE CHEMISTRY AND DYEING.**

This will be a continuation of the Textile Chemistry and Dyeing of the second year, and will include a review of the second year's work, with the introduction of many advanced subjects; such as color matching, dye testing, calico printing, comparative dye trials, and the consideration of numerous problems that arise in the dye house.

The course will include a large amount of work in the dyeing laboratory and will be supplemented by trips to a number of the large dye houses and print works in the vicinity.

## **MICROSCOPY.**

The value of the microscope in the detection and examination of the various fibres cannot be over estimated, and often facts may be discovered, and conclusions drawn, which could be arrived at in no other way.

The students in this course will be given as much work with the microscope as time will permit. They will receive instructions in the use of the best microscopes made, and will not only have practice in the examination and detection of the fibres but will be required to become proficient in the preparation of permanent slides.

### QUANTITATIVE ANALYSIS.

This subject is taken up by all regular Chemistry and Dyeing students, and extends through the second and third years of the course.

During the second year, the principles of analytical work are thoroughly taught, the work being based on Talbot's Quantitative Chemical Analysis. Gravimetric analysis is studied during the first term; and volumetric analysis during the second term. The samples analyzed include salts, ores, minerals, bleaching powder, and alkalies. Frequent recitations are held for the discussion of methods and the solution of stoichiometrical problems. Students are encouraged to read the standard works and magazines on chemical subjects, in order to cultivate broad views of the science.

The third year work involves the analysis of water, alum, ammonia, soaps, coal, oils, indigo, tannin, and the ultimate analysis of organic compounds, as well as the examination of such substances as starches, gums, and other thickeners, detection of adulterants, etc.

No pains will be spared to give the students the benefits of all the latest researches along the lines of industrial analytical methods, and original work is encouraged in all.

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## Power Weaving Department

The process of making pattern warps.

The construction and use of Spooling and Quilling Machinery for wool and cotton.

The construction and use of Warpers of various kinds.

Long and short chain systems of preparing warps and filling.

Sizing materials and size mixing machinery.

The Woolen Sizing Machine.

The Woolen Beamer.

Drawing-in and Twisting.

Operation of machines named above, and warp preparation in cotton, woolen and worsted, timed to correspond with the respective lecture.

The plain power loom and its construction.

Shedding by cams.

Variety of cams for different

Various pickers and picking motions.

grades of work.

Principles of Beating-up motion.

Force of lay.

Adjusting lag to various grades

Take up and let-off motions.

of cloth.

Minor adjustments of the power loom.

Plain looms as altered for weaving fancy cloth.

Looms constructed for several shuttles.  
 Drop box motions.  
 Different makes of box motions, applied to gingham weaving.  
 Chain building for box looms. Automatic looms.  
 Shuttle changing looms. Filling changing looms.  
 Shedding motions. Single acting dobbies.  
 Double acting dobbies. Spring boxes and other motions  
 Chain building for dobbies. for returning harness.  
 Fan reeds. Oscillating reeds.  
 Handkerchief motions. Lappet motions.  
 Leno weaving. Various shaker motions.  
 Centre selvedge motions. Towel and other pile cloth  
 weaving.  
 Open and close shed looms, for weaving various grades of woolen  
 and worsted cloths.  
 Equal and unequal gear driven looms.  
 Lectures on Jacquard machinery.  
 Single lift Jacquards. Double lift Jacquards.  
 Leno Jacquards.  
 Jacquards specially arranged for ingrain carpet work.  
 Tying up Jacquard harness.  
 Tapestry weaving, quilt weaving, etc.  
 Weave room engineering and equipment.  
 Cost of weave mill operation and statistics of operation.

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## Finishing

Examination of cloth from the loom. Perching, Knotting, Burling,  
 Mending, etc.  
 Preparation of cloth for the Fulling Mill.  
 Flocking and its purpose.  
 Construction and use of the Soaping Machine.  
 Use of soaps and alkalies for fulling and scouring purposes.  
 Construction and use of various types of Fulling Mills and Stocks.  
 Theory and method of fulling various classes of goods.  
 Construction and use of various types of Washing Machines.  
 Theory and method of scouring cloth before and after fulling.  
 Cloth Carbonization.  
 Hydro Extractors and their use.  
 Construction and use of various types of Napping Machines.  
 Construction of various types of Gigs.  
 Theory of Crabbing.  
 Construction and use of various Starching and Water Proofing appar-  
 atus.  
 Construction and use of various types of Tenting and Drying Ma-  
 chines.  
 Construction of Single and Double Shears.  
 Grinding and Setting Shears.  
 Construction and use of the Steam Brush.

Construction and use of Plate and Roller Presses.  
 Method of finishing various classes of Woolen and Worsted goods.  
 Cloth Examining, Measuring, Weighing, Ticketing, Numbering, Rolling,  
 Baling, Casing and Shipping.  
 Construction and use of the various machines necessary for this purpose, Testing apparatus, etc.  
 All the necessary calculations for the various processes of finishing all classes of goods.

## Department of Engineering

### First Year—First Term.

Elements of Mechanics.	Gearing, Pitch of gears.
Force, Work, Power and Energy.	Belting problems.
Measurement of Work and Power.	Link motions.
	Harmonic motions.
	Cam design.
Levers, Toggle joints, etc.	
Windlas, Pulley Blocks.	
Inclined Plane and Wedge Screws.	
Worm and Wheel.	Builder motions.
Elements of Mechanism.	Mangle Wheel.
Angular Velocity.	Aggregate Combinations.
Speed Problems.	Epicyclic Trains.
Rolling Cylinders and Cones.	Differential Motions.

### First Year—Second Term.

Applied Mechanics.	Graphic Statics.
Strength of Materials.	Methods of Testing Materials.

In the above topics will be included as many problems as possible, dealing with the construction of and maintenance of mills, not with the purpose of educating mill engineers, but rather to familiarize the student with the means at hand and processes employed in erecting structures for manufacturing, that they may study their government advantageously.

### Second Year—First Term.

Motive Powers.	Water.	Steam.	Gas.
Water.			
Head and Pressure.		Dams, Canals, etc.	
Measurement of Quantity.		Types of Turbines.	
Measurement of Power.		Governors.	
Steam.			
Elements of Thermodynamics as applied to Steam.			

Types of Boilers.	Mechanical Stokers.
Fuels and Combustion.	Coal Consumption.
Chimneys and Mechanical Draft.	Boiler Test.

Steam Engine.

Simple, Compound and Triple Expansion.	Plain slide valve.
Condensers and Condensing engines.	Corliss and Cam Gears.
	Governors.
	Steam Turbines.

Use of exhaust steam for heating and dye house purposes.

Indicator.

Construction of and use in measuring power and setting valves.

Engine test.

Practical use of indicator and computation of indicator diagrams.

Reducing motors and wheels.

Gas.

Theory and general principles of gas engines.

Types of explosion and internal combustion engines.

Governing devices. Throttling and Hit and Miss type. Igniting devices.

Consumption of gas and costs.

## Second Year—Second Term.

### ELECTRICITY.

Elementary Electricity

Magnetism.

Electrical Measuring Instruments.

Dynamo Electric Machines.

Electric Lamps.

Principles of Alternating Currents.

Alternating Current Apparatus.

Electrical Power Transmission.

Electrical Testing.

### Third Year.

Mill Constructions. Calculations and drawings of modern mill buildings.

Distribution of power and methods of driving machinery.

Mill Fire Protection.

Mill Heating and Ventilation.

Mill Humidifying.

Several courses of lectures on allied subjects by outside lecturers will be added.

## MECHANICAL AND MACHINE DRAWING.

### First Year.

Care and use of Instruments.	Sketching from machine details.
Geometrical Constructions.	Working Drawings.
Elements of Projections.	Tracings.
Isometric Drawings.	Blue Print Process.



### **Second Year—First Term.**

Mechanism problems. Drawing in connection with course in Mechanism, such as cams, gearing problems and other mechanism designs.

### **Second Term.**

Practical sketching from machines for working detail and assembly drawings.

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## **Evening Classes**

The courses of instruction offered in the evening are similar to those of the day; but less time is devoted to the machine or laboratory work, since, in most cases this is of small moment; ordinarily the handling of the machinery is a part familiar to most of the students through contact with it in the day time, and in such cases the explanations and calculations are of the greater importance. In some cases it is possible to pursue two courses together, but this depends always on the arrangement of the schedule for any particular year.

The evening courses are free to graduates of the Evening High and Drawing Schools, operatives of the mills and machine shops, and other residents of Lowell, to such members as may be accommodated in the order in which they are received.

Graduates of other schools, will be received on presentation of proper credentials; for all others, examinations will be held on Thursday, Sept. 22, at 7 p. m. at the School. The candidates must be familiar with the English language, and the principles of arithmetic; for the first part, a short composition must be written on a given theme, and a certain amount must be written from dictation, while in the latter will be included addition, decimals, fractions, percentage, ratio and proportion.

### **Subjects**

The list of subjects embraced in each course is similar to that of the day and may be found beginning at page

### **Certificate**

With the honorable and satisfactory completion of either of the regular evening courses in any subject, the certificate of the School will be awarded.

### **Course 1, Cotton Spinning.—2 Years**

Fee for all except residents of Lowell, \$2.50 per term, \$5.00 per year.

### **Course II [A], Woolen Spinning.—1 Year**

**Course II [B], Worsted Spinning.—2 Years**

Fee for all except residents of Lowell, \$2.50 per term, \$5.00 per year.

**Course III, Designing.—3 Years**

Fee for all except residents of Lowell, \$2.50 per term, \$5.00 per year.

**Course IV, Chemistry and Dyeing.—4 Years**

Fee for all except residents of Lowell, \$2.50 per term, \$5.00 per year. A deposit of \$5 will be required from all who take this course, whether residents of Lowell, or not, to cover the cost of the laboratory breakages; at the end of the year any unexpended balance will be returned, or an extra charge made as the case may be

**Course V. [A], Warp Preparation.—1 Term**

Fee for all except residents of Lowell, \$2.50.

**Course V [B], Weaving.—2 Years**

Fee for all except residents of Lowell, \$2.50 per term, \$5.00 per year.

**Note:**—To secure the certificate of the School in Course V, both A and B must be completed. Course V [A] may be taken with Course V [B], so that the whole may be completed in two years.

**Course VI, Mechanical Engineering.—2 Years**

Fee \$2.50 per term, \$5.00 per year. Free to residents of Lowell.

**General**

The schedule showing the arrangements of classes for each term will be announced at the opening of each term.

## Register of Day Students

1903—1904.

### Third Year.

Name	Course	Address
Abbot, Edward M.	II	Westford, Mass.
Baldwin, Fred A.	II	Andover, "
Clapp, F. Austin	II	Malden, "
Clogston, Raymond B.	IV	Bradford, "
Culver, Ralph F.	IV	Ayer, "
Cutler, B. W. Jr.	III	West Somerville, "
Dewey, James F.	II	Montpelier, Vt.
Donald, Albert E.	II	Springfield, Mass.
Halsell, Elam R.	I	Marion, Miss.
Horsfall, George G.	II	Martinsburg, West Va.
Jones, Everett A.	II	Franklin Falls, N. H.
Jury, Alfred E.	IV	Malden, Mass.
Lucey, Edmund A.	II	Natick, "
MacPherson, W. A.	III	North Adams, "
O'Hara, William F.	IV	Chelmsford Centre, "
Parker, Everett N.	I	Lowell, "
Rothschild, Edward J.	I	New Orleans, La.
Serrat, Harold D.	I	Malden, Mass.
Smith, Ralston F.	I	New Hartford, Conn.
Stevens, Dexter	I	Malden, Mass.
Toovey, Sidney E.	II	Orleans, Mass.
Webb, Frank H.	IV	Haverhill, "
White, Royal P.	II	Lowell, "
Wilson, Walter E. H.	I	Lowell, "

### Second Year.

Name	Course	Address
Adams, Henry S.	I	Haverhill, Mass.
Arundale, Henry B.	II	Lawrence, "
Barden, Leon R.	II	Woburn, "
Boyd, George A.	III	Oakdale, "
Brooks, Joseph H.	I	Haverhill, "
Carr, G. E.	I	Adams, "
Cole, Edward E.	IV	Haverhill, "
Cole, James T.	II	Medford, "
Curtis, William L.	I	Roxbury, "
Danforth, Walter K.	I	Woburn, "

Name	Course	Address
Daniels, Walter W.	II	Pawtucket, R. I.
Dillon, James H.	III	Belchertown, Mass.
Duncan, Robert C.	IV	Woburn, "
Harris, Charles E.	I	Lowell, "
Hollings, James L.	I	Dorchester, "
Hook, Russell W.	IV	West Medford, "
Hunt, Chester L.	III	Lowell, "
Jackson, William C.	IV	Lowell, Mass.
Lee, Wm. H.	II	Holyoke, "
Lewis, Walter S.	IV	Woburn, "
Marra, William J.	III	Holyoke, "
McCleery, Walter L.	IV	Lowell, "
McDonald, Joseph S.	II	Bradford, "
McKenna, Hugh F.	IV	Woburn, "
Meadows, William R.	I	Lowell, "
Midwood, Arnold J.	IV	Lowell, "
Moore, Everett B.	I	Lynn, "
O'Donnell, John D.	I	Holyoke, "
Rodman, Walter	II	LaFayette, R. I.
Sherwell, Walter N.	II	Lowell, Mass.
Shuman, Waldo I.	II	Roxbury, "
Shumway, Alonzo H.	I	Taunton, "
Thompson, Everett L.	I	Woburn, "
Warren, Philip H.	II	Worcester, "
Wightman, William H.	IV	Lawrence, "

#### First Year.

Name	Course	Address
Abell, Frederick T.	II	Lawrence, Mass.
Abbott, Guy S.	II	North Reading, "
Barnet, Willis G.	II	Albany, N. Y.
Bigelow, Edward A.	II	Worcester, Mass.
Bradford, Roy H.	II	Lowell, "
Brookhouse, Albert L.	IV	Salem, "
Buttery, Henry M.	II	Waterloo, N. Y.
Campos, Guy J.	II	Lowell, Mass.
Cheney, Harold W.	III	Clinton, "
Church, Charles R.	II	Lowell, "
Churchill, Charles W.	III	Lowell, "
Clements, R.	III	North Andover, "
Comins, Albert K.	IV	Wakefield, "
Cook, Cheney E.	II	Woonsocket, R. I.
Cook, Frank J.	II	South Boston, Mass.
Currier, Herbert A.	I	Somerville, "
Curtis, Frank M.	I	Roxbury, "
Davis, John P.	IV	Lowell, "
Edwards, Charles B.	II	Haverhill, "
Fleming, Frank E.	IV	Lowell, "

Name	Course	Address
Galun, George L.	II	Jamaica Plain, Mass.
Geb, Harry J.	II	Franklin, "
Hayward, William L.	II	Uxbridge, "
Hennigan, Arthur J.	II	Dorchester, "
Hildreth, Harold W.	II	Westford, "
Hintze, Thomas F.	I	Lowell, "
Joel, Carl B.	II	Fitchburg, "
Julia, Robert A.	III	Lisbon Centre, Me.
Kent, Clarence L.	III	Lawrence, Mass.
Lane, John Wm.	I	Wakefield, "
Mackay, Stewart	III	North Chelmsford, "
McDonnell, William H.	I	South Boston, "
Milliken, Frank R.	II	Malden, "
Morris, James J.	IV	Lowell, "
Newcomb, Guy H.	IV	Fitchburg, "
Norris, Daniel	II	Woburn, "
Noyes, Joseph E.	IV	Georgetown, "
Phaneuf, Horace H.	III	Nashua, N. H.
Plowman, Claude M.	I	Talledega, Ala.
Presson, William H.	IV	Gloucester, Mass.
Prior, Everett L.	II	Malden, "
Reardon, John F.	IV	North Billerica, "
Redmond, Paul A.	I	Rome, Ga.
Roberson, Pat H.	I	Cropwell, Ala.
Sargent, Wm. F.	II	Graniteville, Mass.
Shaw, Benj. C.	I	Lowell, "
Stohn, Alexander C.	I	Roslindale, "
Swan, Guy C.	II	Lawrence, "
Taylor, Harry C.	II	Lowell, "
Taylor, Ralph E.	II	Worcester, "
Thomas, Roland V.	I	Boston, "
Traver, William A.	III	Worcester, "
Varnum, Arthur C.	II	Lowell, "
Wheelock, Stanley H.	II	Uxbridge, "
Whirley, John J.	I	Auburn, Me.
Wood, Herbert C.	III	Lowell, Mass.
Woodruff, Charles B.	I	Boston, "
Wright, Edward Jr.	II	Lawrence, "

#### Specials.

Name	Year	Course	Address
Reader, Louise R.	3	IIIb	Lowell, Mass.
Roberts, Carrie I.	3	IIIb	" "
Donnellan, Frank T.	2	III	" "
MacBrayne, Ralph J.	2	III	" "
Mansur, Arthur	2	II	" "
Pevey, John C.	2	III	" "
Bignall, Mrs. F. A. P.	1	German,	Billerica, "
Buck, William A.	1	VI	Stoneham, "

Name	Year	Course	Address
Conklin, Jennie G.	1	IIIb	Lowell, Mass.
Garvey, Mrs. Wm.	1	IIIb	" "
Gillon, Sadie A.	1	IIIb	" "
Hadley, Walter E.	1	III	" "
Hayward, Ralph M.	1	VI	So. Middleton, "
Hildreth, Clarence E.	1	VI	Westford, "
Irish, William F.	1	VI	Lowell, "
Kane, John	1	III	" "
Macauley, James W.	1	VI	Mattapan, "
Meador, Charlotte M.	1	IIIb	Lowell, "
Meek, Lotta	1	IIIb	" "
Miller, Margaret B.	1	IIIb	" "
O'Reilly, Katherine F.	1	IIIb	" "
Staples, Annabel H.	1	IIIb	" "
Young, Arthur G.	1	III	No. Turner, Me.



## Register of Evening Students

1903—1904.

### POST GRADUATE.

Name	Course	Address
Baldwin, A. L.	IV	Lowell, Mass.
Stokham, B. I.	IV	Lowell, "

### Fourth Year.

Barrington, J.	IV	Methuen, Mass.
Burns, E. J.	IV	Lowell, "
Burns, J. E.	IV	" "
Knapton, S.	IV	" "

### Third Year.

Name	Course	Address
Ballou, L. H.	III	Lawrence, Mass.
Cheetham, J. J.	I	Lowell, "
Cutler, C. L.	IV	" "
Dakin, J. K.	III	" "
Davis, P. T.	I	" "
Delmage, E.	III	" "
Frank, E. M.	III	Lawrence, "
Hunton, L. G.	IV	Lowell, "
Lord, H. D.	III	" "
Notman, F. W.	I	" "
O'Neill, P. F.	IV	Lawrence, "
Patrick, A.	III	Lowell, "
Redman, H. S.	III	" "
Reed, E.	I	" "
Rooney, G. W.	I	" "
Rouse, J. C.	IV	" "
Sargent, E. W.	III	Dracut, "
Silk, F. C. M.	IV	Lowell, "
Smith, E.	I	" "
Sterling, W.	III	" "
Tonge, J.	IV	Lawrence, "

# Second Year.

Name	Course	Address
Adams, M. E.	VI	Lowell, Mass.
Alister, J. S.	III	" "
Bastow, A. H.	IV	" "
Bake, H.	III	" "
Balmforth, W. F.	VI	No. Billerica, "
Balmforth, J. H.	IIb	No. Billerica, "
Barket, J. P.	V	Lowell, "
Bock, A. E.	VI	" "
Boucher, J. L.	VI	" "
Brimigion, C.	IV	" "
Brown, J. P.	III	" "
Burke, T. F.	I	" "
Butler, B. O.	VI	" "
Cady, A. S.	VI	" "
Callahan, P. A.	VI	" "
Caron, C.	I	Lawrence, "
Choate, A. J. R.	I	Lowell, "
Cilley, O. H.	III	" "
Couley, F. A.	VI	" "
Connors, E. F.	VI	" "
Davis, P. T.	I	" "
Demaraïs, A. J.	VI	" "
Desrosiers, F.	V	" "
Dick, H. P.	III	" "
Dimlick, B. C.	III	Lawrence, "
Doole, G. L.	VI	Lowell, "
Dooley, E. W.	VI	" "
Donahue, M. F.	VI	" "
Downey, W. J.	IIb	Lawrence, "
Duggan, F. P.	VI	Lowell, "
Eyers, J. T.	IV	Lowell, "
Firth, C. H.	IIb	Methuen, "
Foster, S. F.	I	Lowell, "
Fowler, G. L.	VI	" "
French, E. J.	I	" "
Gaunt, N. E.	IIb	Methuen, "
Gray, J.	III	Lowell, "
Gray, F. M.	VI	" "
Griffin, C.	VI	" "
Haggerty, J. M.	VI	" "
Halsell, E. R.	III	" "
Haven, G. W.	III	Melrose Highlands, "
Hempel, F.	V	Lawrence, "
Higgins, J. A.	IIb	North Billerica, "
Holt, L.	I	Lowell, "
Houle, A. E.	IV	" "
Hoyle, J.	IIb	" "
Jeannotte, A.	VI	" "

Name	Course	Address
Johnson, W. E.	I	Lawrence, Mass.
Johnson, F. E.	IV	Lawrence, "
Jones, E. G.	II	Lowell, "
Kelley, T. F. J.	IV	" "
Kenworthy, J.	I	" "
Kershaw, W. E.	V	Billerica, "
Kidd, T. E.	IV	Lowell, "
Langevin, F. D.	VI	" "
Lord, W.	IV	Lawrence, "
Mansur, A. T.	II	Lowell, "
Mason, R.	III	" "
McCarthy, J. F.	III	" "
Meadows, W. R.	III	Lowell, "
Merrill, E. C.	VI	Lawrence, "
Miller, E. H.	V	" "
Molloy, H.	III	Lowell, "
Moorehouse, T.	VI	Lawrence, "
Murphy, J. H.	VI	Lowell, "
Notman, F. W.	I	" "
O'Brien, D. A.	IV	" "
O'Donnell, J. D.	III	" "
Owens, T. F.	I	" "
Peel, J.	III	North Andover, "
Redmond, P. A.	I	Lowell, "
Reed, F. C. K.	VI	Lawrence, "
Rhodes, J. E.	V	Lowell, "
Rothschild, E. J.	III	" "
Sargent, E. W.	III	Collinsville, "
Shaw, J.	V	Lowell, "
Skinner, C. W.	III	Methuen, "
Smith, A.	III	Lewrence, "
Smith, E.	I	Lowell, "
Smith, J. W.	IIb	" "
Smith, W. E.	III	Methuen, "
Smith, G. A.	III	" "
Smith, W. E.	VI	Lowell, "
Stiles, J. W.	VI	" "
Stopherd, W. H.	III	" "
Thomas, R. R.	VI	" "
Thompson, C. B.	VI	" "
Udell, C. W.	IV	Dracut, "
Wain, Mary A.	III	No. Billerica, "
Webb, F.	V	Lowell, "
Weiss, H.	IV	Lawrence, "
Whitworth, A.	IIb	Lowell, "
Wilson, L. L.	I	Lowell, "
Woodcock, E. C.	III	Lawrence, "

#### First Year.

Name	Course	Address
Abbott, P. M	I	Lowell, Mass.

Name	Course	Address	
Adams, Wm. R.	V	North Andover,	Mass.
Adler, O.	V	Lowell,	"
Appleyard, E. J.	IIb	Lawrence,	"
Archambeault, G.	V	Lowell,	"
Ashford, R.	VI	Lawrence,	"
Ashworth, B. F.	VI	Lowell,	"
Ayer, N. F.	V	Boston,	"
Bachelder, C. F.	I	Lowell,	"
Badger, C. V.	VI	"	"
Bahan, W. H.	III	Lawrence,	"
Bake, F.	IV	"	"
Barclay, C. L.	VI	Lowell,	"
Bardsley, T. E.	V	Lawrence,	"
Barrington, J. L.	V	No. Billerica,	"
Barris, G. W.	VI	Lowell,	"
Barry, E. J.	I	Lawrence,	"
Bassett, T. F.	VI	Lowell,	"
Bastow, H.	V	Lawrence,	"
Bastow, S. W.	IV	Nashua,	N. H.
Bennett, F. W.	IV	Lawrence,	Mass.
Bignall, Mrs. F. A. P.	III	Billerica,	"
Bixby, G. C.	V	Lowell,	"
Blennerhassett, D. N.	VI	"	"
Bonan, Leo F.	III	"	"
Bowie, A. C.	VI	Lawrence,	"
Bowie, S. A.	VI	"	"
Bowker, A. B.	VI	"	"
Bradford, R. H.	III	Lowell,	"
Breen, P. P.	VI	"	"
Brien, G. C.	I	Lowell,	"
Briggan, G. F.	VI	"	"
Brown, W. P.	VI	"	"
Brown, E. A.	IV	"	"
Brouder, J. J.	III	Lawrence,	"
Bruce, R.	IV	Lowell,	"
Bryant, E. L.	VI	"	"
Buckley, H.	IV	Lawrence,	"
Burke, T. F.	I	Lowell,	"
Burnham, J. W.	III	Lawrence,	"
Burnham, F.	I	Lowell,	"
Buzzell, G. L.	VI	"	"
Cady, D. J.	III	Lawrence,	"
Callahan, D. F.	VI	Lowell,	"
Carlson, C. A.	IIb	West Chelmsford,	"
Carroll, F. C.	IV	Lowell,	"
Carroll, G. H.	VI	"	"
Carrol, F. D.	III	"	"
Carroll, G. F.	III	"	"
Carter, W. A.	III	"	"
Carter, H.	VI	Lawrence,	"

Name	Course	Address
Chadbourne, A. E.	VI	Lowell, Mass.
Chain, W. G.	VI	Lowell, "
Charnley, T.	I	Methuen, "
Chase, W. I.	IIb	Lowell, "
Chase, R. F.	V	" "
Clark, R. L.	III	" "
Clark, C.	III	" "
Clark, E. L.	VI	Lawrence, "
Coburn, E. R.	IV	Methuen, "
Cochrane, G. L.	IV	Lowell, "
Colburn, F. A.	VI	" "
Cole, J. H.	VI	" "
Cole, W. F.	I	" "
Collins, Margaret	III	Dracut, "
Collins, M. J.	III	Lowell, "
Conaton, T.	V	" "
Conley, P. J.	III	" "
Conley, J. F.	VI	" "
Coulombe, A.	V	" "
Connor, E.	V	" "
Connors, J. T.	V	Lawrence, "
Corcoran, J. M.	III	Lowell, "
Cove, J. R.	VI	" "
Cox, W.	V	" "
Crompton, G.	VI	Lawrence, "
Crowley, W. L.	V	Lowell, "
Cudworth, W. H.	VI	" "
Custer, J. J. E.	V	" "
Daley, P.	III	" "
D'Amour, C. F.	VI	" "
Dana, C. A.	VI	" "
Davis, S. J.	VI	" "
Davis, T. R.	IIb	North Chelmsford, "
Deane, J. M.	VI	Lowell, "
Deane, Kittie	III	" "
Dempsey, J. W.	IIa	" "
Dennison, W. J.	IV	Lawrence, "
Desmond, W. F.	VI	Lowell, "
Devine, E. W.	VI	Dracut, "
Dimlick, W. F.	IV	Lawrence, "
Disney, R. K.	IIa	" "
Dole, F.	III	Lowell, "
Donovan, J.	III	" "
Duce, B.	III	No. Andover, "
Duval, J. A.	IV	Andover, "
Dwyer, A. F.	VI	Lowell, "
Dwyer, G. W.	VI	" "
Dwyer, L. H.	VI	" "
Dwyer, W. H.	V	" "
Earle, E. M.	VI	" "

Name	Course	Address
Eastwood, J. H.	VI	Lawrence, Mass.
Eddy, Mary I.	III	Lowell, "
Edwards, J. R.	IV	" "
Egan, J. J.	III	" "
Erbe, G.	VI	Lawrence, "
Eyers, W. H.	III	Lowell, "
Fair, W.	V	" "
Farley, F. E.	VI	" "
Farnsworth, J.	VI	Lawrence, "
Fay, Mary A.	III	Lowell, "
Fiske, A. H.	I	Weston, "
Fletcher, M. J.	III	Lowell, "
Flint, L. J.	III	Lawrence, "
Forbes, A. D.	III	Lowell, "
Foster, H. L.	VI	" "
Fulton, J.	V	" "
Freeman, F. E.	III	Lawrence, "
Gaffney, J.	IIb	Lowell, "
Gannon, Winifred	III	" "
Gaucher, E.	VI	" "
Gay, E. B.	I	" "
Gendreau, Helen	III	" "
George, W. S.	IV	Nashua, N. H.
Goodchild, G.	VI	Lowell, Mass.
Graham, Sadie F.	III	" "
Greene, B. C.	IV	" "
Gunston, W. J.	III	" "
Hadley, W. E.	III	" "
Haggerty, J.	IV	" "
Haigh, E.	VI	" "
Hallowood, M.	V	" "
Handley, J. J.	VI	" "
Hanglin, A. J.	IV	" "
Harder, E. E.	VI	" "
Harris, E. S. F.	VI	" "
Harrison, A.	V	" "
Harrison, J.	I	" "
Hartley, C. H.	III	North Chelmsford, "
Hartnett, Mary	III	Lowell, "
Hatch, A. L.	I	" "
Hatfield, G.	VI	Nashua, N. H.
Haynes, G.	III	Lowell, Mass.
Haynes, A. P.	III	" "
Heald, E. E.	IIa	" "
Healey, H. W.	VI	" "
Hebert, C.	IV	" "
Hefferon, J.	VI	Lawrence, "
Helliwell, W. E.	III	North Chelmsford, "
Hesselton, H. E.	VI	Lowell, "
Hickson, H. F.	VI	" "



Name	Course	Address
Hinerth, C. C.	IV	Lowell, Mass.
Hoessler, C.	III	Collinsville, "
Hogan, Mamie G.	III	Lowell, "
Horne, J. F. E.	VI	" "
Houle, H. W.	IV	" "
Houston, Wm.	V	Lawrence, "
Howard, T.	V	Lowell, "
Hunt, H. R.	VI	" "
Hunt, C. L.	V	" "
Hutton, R.	III	North Chelmsford, "
Hutton, H.	V	Lowell, "
Ingraham, Wm.	III	" "
Irwin, J. S.	VI	" "
Jackson, A. P.	I	" "
Jeffery, E.	V	" "
Johnson, H. C.	III	" "
Johnson, M.	IV	Methuen, "
Johnson, W. S.	I	Lowell, "
Johnson, E. V.	IIa	" "
Johnson, E. A.	III	Lawrence, "
Judd, A. E.	VI	Lowell, "
Kane, J. J.	VI	" "
Keene, T. R.	VI	" "
Keene, Anna	III	" "
Kelly, J. F.	IV	" "
Kelley, Mary	III	" "
Kendrick, S.	III	" "
Kennedy, M. F.	VI	" "
Kenney, W. J.	VI	" "
Kilcup, N. L.	IIa	Lawrence, "
Kimball, I. D.	VI	Lowell, "
Knight, Jos.	IIb	Cambridge, "
Knowles, F. E.	V	Lowell, "
Knowles, A. C.	VI	North Andover, "
Knowlton, H.	VI	Lowell, "
Laffert, A.	III	Lawrence, "
Lake, J. N.	VI	Lowell, "
Lamont, W. M.	III	Andover, "
Landry, J. B.	III	Lowell, "
Lang, W. A.	I	" "
Langworthy, H. C.	V	Dracut, "
Lavoie, O.	VI	Lowell, "
Lawrence, C.	V	" "
Leavitt, C. J.	V	North Chelmsford, "
Leith, W. H.	V	Lowell, "
Lenahan, T.	IIa	Dracut, "
Lightbown, C. L.	III	Lowell, "
Loiselle, Yvonne	III	" "
Loud, F. H.	III	" "
Long, C. J.	III	Lawrence, "

Name	Course	Address
Lovell, C. E.	VI	Lowell, Mass.
Lynch, G. A.	IV	" "
Mack, J. T.	VI	" "
Maguire, J. H.	VI	" "
Manahan, J. I.	III	" "
Marriott, J. E.	V	" "
Martin, J. C.	Ila	" "
Mason, W.	V	Lawrence, "
Mason, S. S.	IV	Lowell, "
Matthews, J. F.	V	" "
McBride, R. G.	Ila	" "
McCallum, J.	VI	" "
McCartin, F. P.	VI	" "
McCluskey, D. J.	IIf	North Chelmsford, "
McDermott, Catherine E.	III	Lowell, "
McDonald, J. J.	III	" "
McDonald, J. S.	III	Bradford, "
McElroy, G. W.	VI	Lowell, "
McElroy, S. H.	VI	" "
McGarry, A.	VI	" "
McGarry, J.	VI	" "
McGrath, J. H.	III	" "
McGuirk, J. J.	V	" "
McHugh, E. J.	VI	" "
McHugh, C. J.	III	" "
McKenna, M. F.	VI	Lawrence, "
McKenzie, C.	III	Lowell, "
McManus, H.	V	" "
McMenimon, J.	VI	" "
McMichael, R. S.	V	" "
McMillan, F. M.	V	Lawrence, "
McNeill, J. P.	I	Lowell, "
McQuade, H. B.	VI	" "
McQuaid, A. J.	III	" "
Means, R. E.	III	" "
Meehan, J. P.	VI	" "
Meunier, P.	V	" "
Michelmores, H.	III	Lawrence, "
Miller, E.	VI	" "
Mitchell, W. A.	I	Lowell, "
Morrison, W.	IV	" "
Mortenson, C. W.	V	North Billerica, "
Mosley, F.	III	Lowell, "
Moylan, T. F.	VI	" "
Mungall, W. S.	IV	" "
Murphy, E. V.	VI	Lawrence, "
Murray, J. J.	IIf	Lowell, "
Myers, J. W.	V	" "
Myers, J. Y.	V	" "
Naylor, S.	IIf	Lawrence, "

Name	Course	Address	
Nealand, F.	I	Lowell, Mass.	
Nelson, E. H.	III	"	"
Noble, E.	VI	Lawrence,	"
Noble, J. T.	IV	Lowell,	"
Nowlan, E. E.	IIb	"	"
O'Brien, F. P.	VI	"	"
O'Brien, W. F.	III	"	"
O'Brien, D.	I	"	"
Oddie, W.	III	"	"
Oddie, S. G.	VI	"	"
O'Donnell, J. D.	III	"	"
O'Donoghue, M. T.	VI	"	"
Olney, Mrs. Bertha H.	IV	"	"
O'Meara, W. H.	VI	"	"
O'Neil, J.	III	"	"
O'Neill, J. H.	VI	"	"
O'Neill, C. F.	VI	"	"
O'Reilly, Anna G.	III	"	"
Osgood, C. F.	IIb	"	"
Owens, T. F.	I	"	"
Palm, C. H.	VI	"	"
Parker, H. S.	VI	Lawrence,	"
Parkinson, A. E.	I	Lowell,	"
Patterson, P. W.	I	"	"
Peacock, M. C.	VI	"	"
Pease, F. M.	I	Lawrence,	"
Pedlar, W. A.	I	Methuen,	"
Peirce, Grace L.	III	Lowell,	"
Perkins, T.	III	"	"
Pickup, J. H.	IV	"	"
Pihl, J. A.	VI	"	"
Place, R. E.	V	"	"
Plowman, C. M.	III	"	"
Powers, J. F.	IIb	Lawrence,	"
Powers, M. F.	V	"	"
Prescott, E. H.	VI	Lowell,	"
Quinn, J. P.	III	"	"
Regan, F. A.	V	"	"
Reynolds, P. J. F.	VI	"	"
Roberts, E. J.	VI	"	"
Roberts, H.	II	Lawrence,	"
Robinson, H. H.	III	Lowell,	"
Robinson, J.	VI	Lawrence,	"
Robinson, B.	IIb	Methuen,	"
Roebuck, W. H.	IIa	Collinsville,	"
Rolfe, F. A.	IIa	Lowell,	"
Rourke, W. F.	IV	"	"
Rourke, T. J.	VI	"	"
Rouse, J. C.	IV	"	"
Riley, J. E.	VI	"	"

Name	Course	Address
Riley, S.	VI	Lowell, Mass.
Ring, R. G.	IV	" "
Ryan, W. H.	VI	" "
Ryan, R.	VI	" "
Ryan, J. D. W.	VI	" "
Sanborn, Edith T.	III	" "
Sargent, H. L.	III	Lawrence, "
Scanlon, D. F.	III	" "
Schermerhorn, G. E.	V	Lowell, "
Senior, A.	V	" "
Shafter, A. E.	III	" "
Shanley, J. F.	VI	" "
Shanley, J. E.	VI	" "
Shaw, H.	III	" "
Shaw, W. H.	V	" "
Shaw, S. J.	III	" "
Shugrue, C. F.	VI	Westford, "
Shuman, W. I.	III	Lowell, "
Silcox, W. J.	I Ib	" "
Silcox, S. H.	VI	" "
Smith, A. B.	I	" "
Smith, H. E.	IV	" "
Sorenson, D. P.	III	Dracut, "
Spillane, W. T.	V	Lowell, "
Spindler, E. O.	IV	" "
Spurr, J. H.	IV	Lawrence, "
Stack, M.	V	Lowell, "
Stevens, F. R.	VI	" "
Stratton, J. W.	I	" "
Sunbury, B. O.	VI	" "
Sutherland, D. W.	I Ib	" "
Sutherland, J.	III	" "
Sykes, G. B.	V	" "
Sykes, J. M.	V	" "
Talbot, F. R.	VI	" "
Tarpey, J. F.	I Ib	" "
Thereault, Rose E. M.	III	" "
Thomas, C. H.	III & V	" "
Thomas, R. R.	VI	" "
Trudeau, A.	VI	" "
Tutin, N.	III	" "
Tyrrell, W. T.	VI	" "
Upton, F. A.	V	" "
Wagg, L. E.	V	" "
Walker, G. H.	VI	Lawrence, "
Walker, R.	V	Lowell, "
Wallace, C.	V	" "
Walworth, R. E.	VI	" "
Warner, J. S.	VI	North Chelmsford, "
Watnough, J. T.	I Ib	Lawrence, "

Name	Course	Address
Webster, O. H.	VI	Lowell, Mass.
Weegan, E. L.	VI	" "
West, A. L.	VI	Methuen, "
Wheelock, S. H.	IV	Lowell, "
Whittet, H. H.	I	" "
Whitworth, Lillian	III	" "
White, R. P.	IV	" "
Wholey, W. P.	I	" "
Wilcox, A. W.	V	" "
Wilder, C. W.	IV	North Billerica, "
Williams, N. E.	V	Lowell, "
Wilson, E. H.	VI	" "
Wiswall, F. T.	V	Lawrence, "
Woods, W. E.	VI	Lowell, "
Wolf, W. C.	IV	Lawrence, "
Worth, S.	I	Lowell, "
Young, A. G.	III	" "
Anderson, Arthur	Arithmetic.	Lowell, Mass.
Bernbe, Napoleon	"	" "
Bake, Frank	"	Lawrence, "
Bradley, Edward	"	Lowell, "
Calnin, John	"	" "
Campbell, Archibald	"	" "
Connolly, Michael	"	" "
Curran, J. F.	"	" "
Dufresne, Moses	"	" "
Kennedy, Wm. L.	"	" "
Kelly, John J.	"	" "
Lambert, Maurice J.	"	" "
Lee, Thomas J.	"	" "
Lessard, George	"	" "
Lavalle, James	"	" "
Loughran, John	"	" "
McCormick, Alfred	"	" "
McCormick, James	"	" "
Mooney, Wm.	"	" "
Murray, James J.	"	" "
Plant, Joseph A.	"	" "
Parkinson, Thomas	"	" "
Quinn, D. H.	"	" "
Reid, Robert	"	Lawrence, "
Rousseau, Arthur	"	Lowell, "
Ryan, Wm. H.	"	" "
Wilcox, A. W.	"	" "

### SUMMARY

Day Students . . . . .	140
Evening Students . . . . .	517
Total . . . . .	657
Names counted twice . . . . .	29
	628

577  
122

1824  
211

aff - 18  
fail - 2  
32

## Class of 1904

### Graduates With Titles of Theses.

#### Day Classes.

##### Diplomas awarded as follows:

- Dexter Stevens, Cotton Manufacturing, Malden, Mass.  
"A Special Problem in Cotton Spinning."
- William R. Meadows, Cotton Manufacturing, Lowell, Mass.  
"A Comparison of the Work done by the Heilman and  
Alsatian Combers."
- E. M. Abbott, Wool Manufacturing, Westford, Mass.  
Thesis with G. G. Horsfall.  
"The Relation of Twist to Breaking Strength in Single  
Worsted Yarns."
- F. A. Baldwin, Wool Manufacturing, Andover, Mass.  
Thesis with R. P. White.  
"A Study of Double Mule Spinning."
- F. A. Clapp, Wool Manufacturing, Malden, Mass.  
"The Effect of Gilling on the Percentage of Noil in  
Worsted Combing."
- J. F. Dewey, Wool Manufacturing, Montpelier, Vt.  
"The Effect of Moisture on the Breaking Strength of  
Worsted Yarn."
- A. E. Donald, Wool Manufacturing, Springfield, Mass.  
Thesis with E. A. Lucey.  
"Power Measurements on a Crompton & Knowles Worsted  
Loom by Means of an Electric Dynamometer."
- E. A. Lucey, Wool Manufacturing, Natick, Mass.  
Thesis with A. E. Donald.
- R. P. White, Wool Manufacturing, Lowell, Mass.  
Thesis with F. A. Baldwin.
- B. W. Cutler, Jr., Designing, West Somerville, Mass.  
"The Construction of Double Plain Fabrics and Ingrain  
Weaves."
- W. A. MacPherson, Designing, North Adams, Mass.  
"Tapestry Design Construction."



R. B. Clogston,	Chemistry and Dyeing, "Mordanting of Wool."	Bradford, Mass.
R. F. Culver,	Chemistry and Dyeing, "Application of Basic Colors in Textile Printing."	Ayer, Mass.
A. E. Jury,	Chemistry and Dyeing, "Production of Green in Textile Coloring."	Malden, Mass.
F. H. Webb,	Chemistry and Dyeing, "Rosin Soaps and Their use in Textile Work."	Haverhill, Mass.

#### Certificates for Partial Courses awarded as follows:

E. R. Halsell,	Thesis with W. E. H. Wilson. "An Experiment to Show the Effect of Draft upon the Evenness and Strength of Cotton Yarn."	Marion, Ala.
E. N. Parker,	"An Experiment to Determine what Settings of the Card Flats will Produce the best Yarn with the least Waste."	Lowell, Mass.
R. F. Smith,	"A Comparison of Strengths Between Yarns Made from Roving of Hard, Medium and Soft Twist."	New Hartford, Conn.
W. E. H. Wilson,	Thesis with E. R. Halsell.	Lowell, Mass.
J. D. O'Donnell,	"The Migration of an Industry."	Holyoke, Mass.
G. G. Horsfall,	Thesis with E. M. Abbott.	Martinsburg, West Va.
E. A. Jones,	"The Jacquard."	Franklin Falls, N. H.
S. E. Toovey,	"Cloth Strength Tests."	Orleans, Mass.
Wm. F. O'Hara,	"Investigation of the Methods of Decolorizing Dyed Textile Material and of Carbonizing Wool together with a Special Study of the Application of Titanium Salts in the Textile Industry."	Chelmsford, Mass.

#### EVENING CLASS OF 1904.

##### Certificates were awarded as follows:

##### Course 1 — 3 Years.

##### (Cotton Spinning.)

John Joseph Cheetham,	Lowell, Mass.
Prentice T. Davis,	" "
George William Rooney,	" "
Edward Smith,	" "
Frederick William Notman,	Boston, "

**Course IIa — 1 Year.**

(Woolen Spinning.)

John William Dempsey,	Lowell, Mass.
Robert George McBride,	" "
John F. Tarpey,	" "
Wilfred Lord,	Lawrence, "

**Course IIb — 2 Years.**

(Worsted Spinning.)

John W. Smith,	Lawrence, Mass.
Joseph Hoyle,	Lowell, "
Alfred C. Gaunt,	Methuen, "

**Course II (a and b) — 3 Years.**

James H. Balmforth,	North Billerica, Mass.
James Andrew Higgins,	" " "

**Course III — 3 Years.**

(Designing.)

Edward Delmage,	Lowell, Mass.
Emil M. Frank,	Lawrence, "
Alexander Patrick,	Lowell, "
Walter Sterling,	" "
Henry Stewart Redman,	" "
Harry Dimmock Lord,	" "

**Course IV — 4 Years.**

(Chemistry and Dyeing.)

John Barrington,	Methuen, Mass.
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**Post Graduate — 1 Year.**

Burton Irving Stockham,	Lowell, Mass.
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**Course V — 2 Years.**

(Weaving.)

John <del>Henry</del> Barker,	Lowell, Mass.
William Emery Kershaw,	Billerica, "
Frank Hempel,	Lawrence, "
Emil H. Miller,	" "
Joseph Edward Rhodes,	Lowell, "
James Shaw,	" "
Francis Henry Webb,	" "

**Course VI 2 Years.**

(Mechanical Engineering.)

Edward Francis Connors,	Lowell, Mass.
Frederick A. Conley,	" "
Patrick Andrew Callahan,	Lawrence, "
Benjamin O. Butler,	Lowell, "
John L. Boucher,	" "

Charles B. Thompson,	Lowell, Mass.
William Frederick Balmforth,	North Billerica, "
Michael Edward Adams,	Lowell, "
Foster C. K. Reed,	Lawrence, "
Thomas Moorehouse,	" "
Edwin C. Merrill,	" "
Felix Dennis Langevin,	Lowell, "
Arthur Jeannotte,	" "
Francis P. Duggan,	" "
Edward William Dooley,	" "
George Lee Doole,	" "
Michael F. Donahue,	" "
John Henry Murphy,	" "

### List of Past Students

(C) Indicates Certificates, Partical Course.

(D) Indicates Diploma, Complete Course.

(P. G.) Indicates Post Graduate Course.

#### Day Course, 1899.

Name	Course	Occupation.
Bailey, J. W.	I D	Principal Bradford Durfee Textile School, Fall River, Mass.
Burrage, Katherine	IIIb C	Lowell, Mass.
Cuttle, J. H.	II D	Designer, Arlington Mills, Lawrence, Mass.
Fels, A. B.	II D	Sec. to Gen. Mgr. Mass. Electric Co., Boston, Mass.
Harriman, H. I.	V	Agent American Loom Co., Readville, Mass.
Hastings, Walter L.	I	Ass't. Agt. Arlington Mills, Lawrence, Mass.
Harmon, C. F.	I D	In Business, Lowell, Mass.
Mackay, R. N.	I	Selling Agent, American Loom Co., Readville, Mass.
Smith, A. A.	I D	Lowell, Mass.
Tilton, E. T.	II D	With Assabet Mills, American Woolen Co., Maynard, Mass.

#### Evening Course, 1899.

Name	Course	Occupation.
Binns, Heaton,	II & V C	Overseer Bigelow Carpet Co., Lowell, Mass.
Broadbent, James T.	I C	Instructor, Carding and Spinning, Bradford Durfee Textile School, Fall River, Mass.
Collier, John	III C	Designer, Knoxville, Tenn.
Crompton, H. H.	II C	Second Hand, French Drawing, Arlington Mills, Lawrence, Mass.

Name	Course	Occupation
Gaunt, A. C.	III C	Designer, Tremont Worsted Co., Methuen, Mass.
Margerison, I. D.	II C	Section Hand, Worsted Combing, Arlington Mills, Lawrence, Mass.
Kellett, Irvine	II C	Second Hand, Worsted Spinning, Lower Pacific Mills, Lawrence, Mass.
McAllister, J. W.	V C	Salesman, Herman Metz Co., Charlotte, N. C.
Moir, A. L.	III C	Letter Carrier, Lowell, Mass.
Noble, J. T.	V C	Bookkeeper, Walsh Mill, Lowell.
Nugent, T. A.	II & V C	Second Hand, Bigelow Carpet Co., Lowell, Mass.
Spedding, E. H.	III C	Second Hand, Weaving, Tremont & Suffolk Mills, Lowell, Mass.
Stevenson, Wm.	II C	Supt. Franklin Woolen Mills, Franklin, Ky.
Stopherd, W. H.	II & V C	Overseer, Bigelow Carpet Co., Lowell, Mass.
Swift, Edward S.	V C	Ass't Supt. Bourne Mill, Fall River, Mass.
Wilmot, William	III C	Designer, Hamilton Web Co., Hamilton, R. I.
Wilton, E. H.	III C	Overseer of Designing, Stevens Mills, No. Andover, Mass.

#### Day Course, 1900.

Name	Course	Occupation
Baldwin, A. L.	IV D	Textile Chemist, Western Electric Co., Chicago, Ill.
Barr, I. W.	I D	Designer, Clarence Whitman & Co., New York, N. Y.
Bodwell, H. A.	II D	Ass't. Supt. Smith & Dove Mfg. Co., Andover, Mass.
Brickett, C. J.	II D	Instructor, Textile Dept. International American School of Correspondence, New Bedford, Mass.
Burrage, Katherine P. G.	IIIb C	See 1899 Day Course.
Campbell, Laura E.	IIIb C	Designer, Lowell, Mass.
Goodhue, Amy H. (Harrison)	IIIb	Dracut, Mass.
Lakeman, Fannie S.	I Ib C	Designer, Salem, Mass.
Lamson, George F.	I D	Draftsman, Merrimac Mfg. Co., Lowell, Mass.
Leach, John P.	I & V C	Foreman, Carding Dept., Harriet Cotton Mills, Henderson, N. C.
Merchant, Edith C.	IIIb C	Designer, Lowell, Mass.
Parker, Harry C.	V C	In Business, Fitchburg, Mass.
Perkins, John E.	III D	Ass't. Supt. and Designer, S. W. & C. Russell Woolen Mills, Pittsfield, Mass.

Name	Course	Occupation
Pradel, A. J.	III D	Designer, Dickey Mfg. Co., Baltimore, Md.
Sleeper, Robert R.	IV D	With Herman Metz Co., Dyestuffs, New York City.
Smith, Stephen E.	I D	Head Ins't. Cotton Dept. Lowell Textile School, Lowell, Mass.
Stewart, A. A.	II D	Ins't. in Finishing, Lowell Textile School, Lowell, Mass.
Syme, James F.	II D	Agent Ray Mills, (American Wool-en Co.) Franklin, Mass.
Thompson, H. J.	IV D	Dyer, Boston Rubber Shoe Co., Malden, Mass.
Woodies, Ida A.	IIb C	Ass't. Inst. Art Dept., Lowell Textile School, Lowell, Mass.

#### Evening Course, 1900.

Name	Course	Occupation
Campbell, A. D.	IIb C	Section Hand, Worsted Drawing, Arlington Mill, Lawrence, Mass.
Cawthra, A. B.	IIb C	Overseer, Worsted Spinning, U. S. Bunting Co., Lowell, Mass.
Colby, A. D.	I C	Foreman, Card Dept., Lowell Machine Shop, Lowell, Mass.
Donnelly, J.	I C	Second Hand, Mule Room, Tremont & Suffolk, Lowell, Mass.
Elston, F. R.	III C	Designer, American Woolen Co., Fitchburg, Mass.
Howard, J.	V C	Overseer of Weaving, Lowell, Mass
Hutton, Clarence	V C	Lowell, Mass.
Jones, W. J.	IIb C	Overseer, Worsted Spinning, U. S. Bunting Co., Lowell, Mass.
Maden, H.	IIb C	Second Hand, Worsted Spinning, U. S. Bunting Co., Lowell, Mass.
Nelson, Ernest	IIb C	Pattern Weaver, Massachusetts Mills, Lowell, Mass.
Ogley, S. A.	IIb C	Overseer, Worsted Spinning, Moore Spinning Co., No. Chelmsford, Mass.
Osgood, C. F.	I C	Draftsman, Lowell Machine Shop, Lowell, Mass.
Rowell, H. C.	I & IIb C	Deceased.
Silcox, A. E.	I C	Draftsman, Lowell, Mass.
Snow, F. L.	IV C	Overseer, Dyeing and Bleaching, Lawrence Mfg. Co., Lowell, Mass.
Wardrobe, W. L.	I C	
Waterhouse, J.	IV C	Storekeeper, Merrimack Print Works, Lowell, Mass.
Wing, C. T.	III C	Designer, Middlesex Mfg. Co., Lowell, Mass.
Woodbury, W. S.	I C	Overseer, Carding, Dana Warp Mills, Westbrooke, Me.

### Day Course, 1901.

Name	Course	Occupation
Bradley, Richard	V C	Loom Fixer, Atlantic Mills, Providence, R. I.
Buchan, D. C.	II D	Boss Weaver, Atlas Linen Co., Meredith, N. H.
Currier, John A.	II D	Ass't. Supt., Haile & Frost Mfg. Co., Hinsdale, N. H.
Ewer, N. T.	IV D	Dye Tester, N. Y. & Boston Dye-wood Co., East Boston, Mass.
Foster, C. E.	II D	With Davis & Furber Machine Co., No. Andover, Mass.
Harrison, Amy H. (Goodhue)	IIIb C	(P. G.) Dracut, Mass.
Kingsbury, P. F.	IV D	Color Maker, Hamilton Print Works, Lowell, Mass.
Marinel, W. N.	I D	Mechanical Engineer, DeBona Marble Co., Quincy, Mass.
Moorhouse, W. R.	IV D	Dyer, Cassela Color Co., Frankfort-on-the-Main, Germany.
Parker, B. M.	I D	Inst. Textile Dept. Clemson College, N. C.
Webber, A. H.	IV D	Dyer, F. E. Atteaux & Co., Boston, Mass.
Wise, P. T.	II D	Supt. Brookside Mill, W. Chelmsford, Mass.
Woodies, Ida A. (P. G.)	IIIb C	See 1900 Day.

### Evening Course, 1901.

Name	Course	Occupation
Aspinwall, Wm.	IIb C	Collector, Lawrence, Mass.
Berry, F. M.	V C	Deceased.
Brooks, Noah	III & V C	
Burghardt, P. C.	IIa C	Second Hand, Card Room, Merri-mack Woolen Co., Lowell, Mass.
Buzzell, Wm. O.	III C	Second Hand, Weaving, Acushnet Mills, New Bedford, Mass.
Cheetham, J. J.	III C	Overseer, Spooling, Massachusetts Mills, Lowell, Mass.
Chippendale, E. W.	IIb C	Section Hand, Worsted Combing, U. S. Bunting Co., Lowell, Mass.
Cowdell, Herbert	V C	Fixer, Massachusetts Mills, Lowell.
Davis, Henry	IIb C	Overseer, Worsted Carding, Hudson, Mass.
Donovan, D. F.	IIa C	Second Hand, Woolen Carding, Yonkers, N. Y.
Evison, Wm. A.	V C	Weaver, Lowell, Mass.
Farrell, T.	IIa C	Woolen Spinner, Stirling Mills, Lowell, Mass.
Frame, Wm.	V C	Loomfixer, Lowell, Mass.



Name	Course	Occupation
Gagan, J. H.	V C	Overseer, Stirling Mills, Lowell.
Grant, Archibald	IIb C	Section Hand, Spinning and Twisting, Bigelow Carpet Co., Lowell, Mass.
Groucke, Michael	IIb C	Section Hand, Worsted Combing, Bigelow Carpet Co., Lowell, Mass.
Hill, Daniel	IIb C	Overseer, Sanford Mills, Sanford, Me.
Hitchcock, T. B.	I-II-III C	With American Woolen Mills, Charlotte, N. C.
Holgate, C. H.	IIa C	Wool Buyer, Boston, Mass.
Hunter, Ralph	III C	Clerk, Joy, Langdon & Co., New York.
Jones, W. J.	IIa C	See 1900 Evening.
Killerby, Walter	IIb C	Supt. Park Worsted Mills, Lowell, Mass.
Law, Alfred	IIb C	Section Hand, Worsted Combing, Arlington Mills, Lawrence, Mass.
Lord, Wilfred	III C	Asst. Designer, Lowell Pacific Mills, Lawrence, Mass.
McQuade, H. B.	V C	Section Hand, Bigelow Carpet Co., Lowell, Mass.
Minge, J. C.	III-I-V C	Sec. and Treas. B. Minge Mfg. Co., Demopolis, Ala.
Morris, Frank H.	V C	Loomfixer, Belvidere Woolen Mills, Lowell, Mass.
Nelson, Ernest	IIa C	Pattern Weaver, Mass. Mills, Lowell, Mass. (See 1900)
Noble, J. T.	III C	Bookkeeper, Walsh Mills, Lowell, Mass. (See 1899 Evening)
Peel, Hudson	IIb C	Section Hand, Worsted Spinning, Arlington Mills, Lawrence, Mass.
Reynolds, H. L.	III C	Overseer Card Room, Merrimack Mfg. Co., Lowell, Mass.
Saunders, E. B.	III C	Second Hand, Weave Room, Fall River Iron Works, Fall River, Mass.
Scanlon, E. J.	IIb C	Wood and Coal Dealer, Lawrence, Mass.
Shannon, Philip	V C	Fixer, Belvidere Mill, Lowell, Mass.
Smith, Fred	IIb C	Overseer, Worsted Spinning, Washington Mills, Lawrence, Mass.
Swift, E. S.	I C	See 1899 Evening.
Wesson, Paul B.	I C	Foreman, Lowell Machine Shop, Lowell, Mass.
Whitehead, Bennett	IIb C	Section Hand, Worsted Spinning, Arlington Mills, Lawrence, Mass.
Wiley, Frank S.	I C	Second Hand, Carding, Lawrence, Mass.
Williamson, I. F.	IV C	Second Hand, Hamilton Print Works, Lowell, Mass.

### Day Course, 1902.

Name	Course	Occupation
Burnham, F. E.	IV D	Chemist, Passaic Print Works, Passaic, N. J.
Carter, Robert R.	IV D	Dyer, Roessler & Hasslacher Chemical Co., Perth Amboy, N. J.
Craig, C. E.	III D	Designer, Nockege Mills, Fitchburg, Mass.
Curran, C. E.	II C	Asst. Designer, Washington Mills, Lawrence, Mass.
Ferguson, A. F.	I C	Asst. Inst. Design Dept. Lowell Textile School, Lowell, Mass.
Harris, George S.	I C	Supt. Sycamore Mills, Sycamore, Ala.
Haskell, Walter F.	IV D	Dyer, Dana Warp Co., Westbrooke, Me.
Holgate, Benj.	III C	Bookkeeper, Lowell Textile School, Lowell, Mass.
Ramsdell, T. E.	I D	Agent Monument Mills, Housatonic, Mass.
Swift, E. S.	III D	See Evening 1899 and 1901.
Wing, C. T.	III D	Designer, Middlesex Mills, Lowell, Mass.
Woodman, H. L.	I C	Draftsman, Mass. Mills, Lowell, Mass.

### Evening Course, 1902.

Name	Course	Occupation
Adams, W. R.	IIa C	Pressman, Stevens Mills, Lowell.
Barlow, R.	V C	Finishing Dept. Hamilton Mfg. Co., Lowell, Mass.
Binns, Heaton	VI C	See Evening, 1899.
Bowring, G. P.	VI C	Machinist, Bigelow Carpet Co.
Brainerd, Irving L.	I C	Fitter, Stoddard Haserick, Richards & Co., Boston, Mass.
Burkhard, E.	IIa C	98 Union St., Lawrence, Mass.
Buzzell, Wm. O.	III C	P. G. See 1901 Evening.
Cheetham, J. J.	III C	P. G. See 1901 Evening.
Collier, J.	III C	P. G. See 1901 Evening.
Cowdrey, C. E.	V C	Weaver, Talbot Mills, No. Billerica, Mass.
Cremin, D. J.	I C	Second Hand, Boott Cotton Mills, Lowell, Mass.
Donnellan, Frant T.	IIa C	Runner, Lowell Textile School.
Dudley, George E.	I C	Third Hand, Carding, Massachusetts Co., Lowell, Mass.
Ferguson, T.	V C	Loom Fixer, Appleton Mills, Lowell, Mass.
Field, C. W.	VI C	Mechanic, Tremont & Suffolk, Lowell, Mass.

Name	Course	Occupation
Forest, F. C.	IIa C	Finishing Room, Middlesex Co.
Fortune, D. A.	IIb C	Section Hand, Worsted Spinning, Lower Pacific Mills, Lawrence, Mass.
Gaunt, A. C.	III C	P. G. See 1899 Evening.
Good, Henry	I C	Overseer, Carding, Merrimack Mfg. Co., Lowell, Mass.
Haigh, W.	III C	U. S. Bunting Co., Lowell, Mass.
Haworth, J.	VI C	Pantagrapher, Merrimack Mfg. Co., Lowell, Mass.
Hogan, J.	V C	
Hoyle, E.	IIb C	Overseer, Worsted Drawing, North Chelmsford, Mass.
Johnson, E. A.	IIb C	Asst. Supt. Worsted Yarn Dept., Washington Mills, Lawrence, Mass.
Kelley, M. H.	I C	Second Hand, Appleton Co., Lowell, Mass.
Kent, E. J.	IIb	Section Hand, Worsted Drawing, Lower Pacific Mills, Lawrence, Mass.
Lamont, W. A.	IIb C	Asst. Supt. Worsted Yarn Dept., Washington Mills, Lawrence, Mass.
Lawless, A. J.	V C	Overseer, Weaving, Belvidere Woolen Co., Lowell, Mass.
Lee, Charles	I C	Third Hand, Boott Cotton Mills, Lowell, Mass.
Leith, Charles	III C	Overseer, Weaving, Clifton Heights Pa.
Libby, C. R.	VI C	Draughtsman, Lamson C. S. S. Co., Lowell, Mass.
Malloy, A.	V C	Beamer, Tremont & Suffolk Mills. Lowell, Mass.
Nugent, T. A.	VI C	See 1899 Evening.
Osgood, C. F.	VI C	See 1900 Evening.
Potter, R. W.	V C	Loom Fixer, Barber Tape Mill, Lowell, Mass.
Rockwell, S. F.	IIa C	Supt. Mule Dept., Davis & Furber Machine Co., No. Andover, Mass.
Schermerhorn, George E.	I C	Second Hand, Combing, Lawrence Mfg. Co., Lowell, Mass.
Smith, W. H.	IIb C	Section Hand, Worsted Spinning, Arlington Mills, Lawrence, Mass.
Stevenson, Wm.	III C	See 1899 Evening.
Stopherd, W. H.	VI C	See 1899 Evening.
Umpleby, T. B.	V C	Supt. Mapleleaf Woolen Co., Mark- ham, Ont., Canada.
Varney, M. H.	III C	Overseer, Amory Mfg. Co., Man- chester, N. H.

Name	Course	Occupation
Vogt, A. H.	III C	Designing Room, George E. Kunhardt, Lawrence, Mass.
Walker, David	III C	Overseer, Burling and Sewing Dept., Collinsville, Mass.
Wilson, C. E.	IIb C	Section Hand, Worsted Twisting, Arlington Mills, Lawrence, Mass.
Wilson, G. H.	IIb C	Section Hand, Worsted Spinning, Lower Pacific Mills, Lawrence, Mass.
Wood, Jno.	I C	Second Hand, Boott Mills, Lowell, Mass.

#### Day Course, 1903.

Name	Course	Occupation
Bennett, E. H.	V C	Saugus, Mass.
Bloom, Wilfred N.	IV D	Chemist at Thomas Leyland & Co., Readville, Mass.
Campbell, Orison S.	II D	With Felt Mfg. Co., Dodgeville, New York.
Campbell, Louise P.	IIIb C	Designer, Lowell, Mass., 83 Queen St.
Chamberlin, Fred'k E.	I D	Loom Fixer, Lancaster Mills, Clinton, Mass.
Emerson, Frank W.	II D	Ass't. in Woolen and Worsted Dept. Lowell Textile School, Lowell.
Evans, William R.	III D	Spinning, Groveland Mills, Haverhill, Mass.
Evans, Alfred W.	III D	Shoe Dealer, Haverhill, Mass.
Ferguson, Arthur F.	I D	Ass't. in Design Dept., Lowell Textile School, Lowell, Mass.
Fuller, George	I D	Designer, Eclipse Mills, Arnold Print Works, No. Adams, Mass.
Gerrish, Walter	III D	Designer, Lowell, Mass.
Holgate, Benj.	V C	See 1902 Day.
Hutton, Clarence	III C	Lowell, Mass.
Morrison, Fred C.	I D	Clerk, Merchants Nat'l Bank, Dover, N. H.
Najarian, Garabed	IV D	Dyer, Monument Mills, Housatonic, Mass.
Petty, George E.	I C	Section Hand, Spinning, Albemarle, N. C.
Rasche, William A.	III D	Deceased.
Reynolds, Isabel H.	III C	Designer, No. Andover, Mass.
Robinson, William C.	III C	Ass't. Designer, The Solway Mills, Westerly, R. I.
Rosenthal, John S.	II D	Designing, with U. S. Bunting Co., Lowell, Mass.
Snelling, Fred N.	II D	Wool Sorting, with E. Frank Lewis, Lawrence, Mass.

Name	Course	Occupation
Spiegel, Edward	V C	Wool Sorting, with U. S. Bunting Co., Lowell, Mass.
Stevenson, Murray R.	III C	Dyeing Dept., B. C. Co., Clinton, Mass.
Stewart, Walter L.	III D	Mercantile, with Catlin & Co., N. Y.
Walker, Anna G.	IIIb C	Lowell, Mass., 332 Pawtucket St.

#### Evening Course, 1903.

Name	Course	Occupation
Balmforth, J. H.	Ila C	Woolen Spinner, No. Billerica, Mass. Talbot Mills.
Balmforth, Martha B.	III C	Ins't Hand Looms, Lowell Textile School, Lowell, Mass.
Barry, E. J.	III C	Overseer, Weaving, Everett Mills, Lawrence, Mass.
Bastow, Henry	III C	Pattern Dresser, Kunhardts, Lawrence, Mass.
Baxter, A. J.	Ila C	Bookkeeper, American Woolen Co., Collinsville, Mass.
Byam, W. S.	VI C	Machinist, Lowell Machine Shop, Lowell, Mass.
Cady, D. J.	V C	Weaving Section Hand, Lawrence, Mass.
Donnellan, F. T.	V C	Runner, Lowell Textile School.
Flynn, J. J.	VI C	Bookkeeper, Lowell, Mass., 334 Suffolk St.
Garner, William	III C	Foreman, Coal Tar Refinery, Washington, D. C.
Gaunt, A. C.	Ila C	Designer, Tremont Worsted Co., Methuen, Mass.
Goodchild, George	I C	Draftsman, Lowell Machine Shop, Lowell, Mass.
Gray, F. M.	VI C	Draftsman, with Lowell Machine Shop, Lowell, Mass.
Howard, J.	III C	Overseer of Weaving, Belvidere Mills, Lowell, Mass.
Higgins, J. A.	Ila C	Woolen Spinner, Talbot Mills, No. Billerica, Mass.
Hunter, R.	V C	See Evening Class, 1901.
Jennings, J. J.	III C	Designer, Lyman Mills, Holyoke, Mass.
Johnson, S. L.	V C	Second Hand, Weaving, Arlington Mills, Lawrence, Mass.
Keleher, J. J.	I Ib C	Section Hand, Worsted, Washington Mills, Lawrence, Mass.
Knowles, F. E.	I C	Section Hand, Card Room, Merri-mack Co., Lowell, Mass.
Lawrence, Charles	I C	Overseer, Mule Spinning, Merri-mack Co., Lowell, Mass.
Leach, J. W.	V C	

Name		Course	Occupation
Lincourt, H. L.		VI C	Machinist, Lawrence Mfg. Co., Lowell, Mass.
Lord, Wilfred,		Iib C	Ass't. Designer, Lower Pacific Mills, Lawrence, Mass.
Mason, F. A.		I C	Insurance Agent, Lowell, Mass.
Mortenson, C. W.		III C	Bookkeeper, Talbot Mills, No. Billerica, Mass.
Moir, A. L.		III C	Letter Carrier, Lowell, Mass.
Mozley, A.		VI C	Heinze Electric Co. Machine Shop, Lowell, Mass.
Myers, J. W.	IV & III	C	Ass't. Supt. U. S. Bunting Co., Lowell, Mass.
Nicholson, Richard		Iib C	Section Hand, Worsted Spinning, Arlington Mills, Lawrence, Mass.
Noonan, D. T.		III C	Loom Fixer, Passaic, N. J.
Palmer, G. B.		III C	Lowell, Mass.
Rockwell, H. D.		Iia C	With Davis & Furber Machine Co., No. Andover, Mass.
Schofield, J. S.		III C	Pattern Weaver, Kunhardt's Mill, Lawrence, Mass.
Schoon, Fenton		Iib C	Section Hand, Worsted Drawing, Lower Pacific Mills, Lawrence.
Stokham, B. I.	(P. G.) IV	C	Section Hand, Dye House, Bigelow Carpet Co., Lowell, Mass.
Tonge, Matthew		III C	Weaver, New Bedford, Mass.
Upton, F. A.		I C	Carder, Merrimack Co., Lowell, Mass.
Varney, M. H.		I C	Overseer, Amory Mfg. Co., Manchester, N. H.
Walker, David	(P. G.) III	C	Overseer, Burling and Sewing Dept., Collinsville, Mass. See Evening, 1902.





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( DAY )

Fill out and send to Wm. W. Crosby, Principal

# Lowell Textile School,

LOWELL, MASS.

## APPLICATION BLANK.

Date .....

I, ..... hereby  
apply for admission to the Lowell Textile School as DAY  
student.

Name in Full, .....

Date and Place of Birth, .....

Home Residence, .....

Parent or Guardian, .....

Residence of Parent, .....

School last attended, .....

( INDICATE COURSE )

- |                          |                           |
|--------------------------|---------------------------|
| I. Cotton Manufacturing. | II. Wool Manufacturing.   |
| III. Designing.          | IV. Chemistry and Dyeing. |

Signature, .....

ENDORSEMENT BY OFFICER OF SCHOOL LAST ATTENDED.

I hereby certify that .....  
the above applicant has completed the regular four years  
course at the ..... High School.

Signed : .....

Principal ..... School, located  
at ..... State of .....

Date .....

FORM FOR EVENING CLASSES ON OTHER SIDE.

( EVENING. )

Fill out and send to Wm. W. Crosby, Principal

# Lowell Textile School,

LOWELL, MASS.

## APPLICATION BLANK.

Date .....

I, ..... hereby  
apply for admission to the Lowell Textile School as EVENING  
student.

Name in Full, .....

Date and Place of Birth, .....

Home Residence, .....

Parent or Guardian, .....

Residence of Parent, .....

School last attended, .....

( INDICATE COURSE )

- |                                  |                               |
|----------------------------------|-------------------------------|
| I. Cotton Spinning.              | IV. Chemistry and Dyeing.     |
| II. Woolen and Worsted Spinning. | V. Weaving. Warp Preparation. |
| III. Designing.                  | VI. Mechanical Engineering.   |

Signature, .....

ENDORSEMENT BY SOME OFFICER OF SCHOOL LAST ATTENDED.

I hereby certify that.....  
the above applicant is duly qualified to pursue with profit the  
work of the Lowell Textile School.

Signed: .....

Principal..... School, located  
at..... State of.....

Date .....

SERIES 8 No. 1

AUGUST, 1904

# BULLETIN

OF THE

## Lowell Textile School

Lowell, Massachusetts, U. S. A.



ISSUED QUARTERLY

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Entered Aug. 26, 1902, at Lowell, Massachusetts  
as second-class matter under Act of  
Congress, July 16, 1894

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Moody Street and Colonial Avenue.

FOR BULLETIN AND TERMS ADDRESS WM. W. CROSBY, PRINCIPAL.

## NOTES

During the summer the Cotton Spinning Department has received from the Whitin Machine Works of Whitinsville, Mass., the following machines: one forty inch revolving flat card; one six head comber; one ribbon lapper; one ring spinning frame, (warp); one ring spinning frame, (filling) From the Universal Winding Co., Providence, R. I., one six gang winder.

The efficiency of this department is much increased by these additional machines; while this make of machine is very acceptable, the increased production of yarn will be welcomed by the department of weaving.

During the past year no fewer than 15 varieties of cotton were carried through from raw stock to yarn.

The Power Weaving Department has received one Stafford silk loom; one Whitin 20-harness dobby loom; three Knowles 32-harness worsted looms; one Schaum & Uhlinger Jacquard head, fitted to 2 x 2 Lowell Machine Shop loom; one 800-hook Jacquard head built by J. Battles & Co.

More original designs were woven by the department last year than ever before; in view of the fact that the new looms were not available for use during the year, the achievement was notable. The increased facilities will allow a considerable advance this year.

Mr. Fred Hardy has resigned and Mr. Joseph Wilmot has been appointed to fill his place.

Prof. Umpleby of the Design Department has returned from Europe with all the latest ideas in his line. He will not have to change the excellent system already in vogue in this department, but rather fortify it, and round out details with data collected during his trip.

The Finishing Department has received a brush and a gig from Curtis and Marble, Worcester, and D. R. Kenyan of Raritan, N. J., will forward very soon a drying and tentering machine.

The process of carbonizing which has become so very important to wool manufacturers will be thoroughly taught in a practical manner and will include carbonizing lambs' wool, noils, burr waste, shivey stock, cotton and wool rags, etc.

The water for this scouring plant will be drawn from a series of driven wells and is what is technically known as "hard water" and without treatment is not suitable for scouring because of the presence in the water of lime, iron, magnesia, etc. The removal of these salts by precipitation will be taught by a complete water softening plant.

The plant of the woolen spinning department has been increased by the addition of a new woolen mule the gift of the makers, Johnson & Bassett, Worcester, Mass., this Mule is their latest heavy pattern, 2 in. gauge and has 120 spindles. The Murdock & Geb Co., Franklin, Mass., has equipped this new mule with their latest bobbin holders.

The school is now in a position to convert grease wool into finished woolen yarn or worsted yarn and to teach all of the processes in a practical manner.

The woolen yarn department in addition to the scouring plant already described consists of the following machinery: one Parkhurst burr picker. One Davis & Furber mixing picker, equipped with Harwood self feeder and Spencer oiler. One set of Davis & Furber woolen cards consisting of first breaker with Bramwell automatic feed and Torrence balling head; second breaker with Torrence creel; finishers ( $\frac{1}{16}$  and  $\frac{1}{8}$  rings) with Apperley feed and Davis & Furber combination rub rolls and apron condenser. One set of Davis & Furber woolen cards consisting of first breaker with Bramwell automatic feed. Second breaker with Kemp feed finisher ( $\frac{1}{2}$  and  $\frac{9}{16}$  rings) with Bates feed and Davis & Furber double apron condensor. The Johnson & Bassett mule already described. One sample mixing card made by Torrence Mfg. Co., Harrison, N. J. One Davis & Furber woolen twister. The card grinding consists of:—one Roy grinding and turning frame, two Roy traverse grinders, and one Entwistle Dronsfield grinder.

The equipment of the worsted yarn department is complete and representative and the student is now taught "Top making" which includes practical sorting, carding, combing and gilling. The machinery in this section includes in addition to the sorting and scouring already described: one Davis & Furber double cylinder and lickerin worsted



card; one Lowell Machine Shop doubler gill box; one Lowell Machine Shop weigh gill box; one Crompton & Knowles ball winder; one Crompton & Knowles noble comb; one Hall & Stells can gill box; one Hall & Stells balling head gill box.

Drawing, spinning and twisting are now taught as a unit and the equipment of machinery is very complete.

The student is first taught the Open or Bradford System of Drawing on the following machinery: Can gill box with creel, Prince, Smith & Son; 2 spindle gill box, Prince, Smith & Son; 2 spindle drawing box, Prince, Smith & Son; 2 spindle weigh box, Lowell Machine Shop; 2 spindle drawing box, Prince Smith & Son; 4 spindle 1st finishers, Prince, Smith & Son; 8 spindle 2nd finishers, Lowell Machine Shop; 12 spindle reducers, Prince, Smith & Son; 24 spindle Dandy Rover, Lowell Machine Shop.

The gift of the Lowell Machine Shop of a cone reducer and a cone rover of 8 and 12 spindles respectively makes possible the teaching of the principles of cone drawing in a very thorough and practical manner.

The spinning and twisting department comprises the following machinery:

1-12 spindle flyer spinning frame, Prince, Smith & Son.

1-12 spindle ring spinning frame, Prince, Smith & Son.

1-12 spindle cap spinning frame, Prince, Smith & Son.

1-48 spindle cap spinning frame, 4 ft. end, Lowell Machine Shop.

1-48 spindle cap spinning frame, 5 ft. end, Lowell Machine Shop.

1-12 spindle cap trap twister, Prince, Smith & Son.

1-12 spindle ring universal Smith Ambler twister, Prince, Smith & Son.

1-48 spindle Boyd twister, Lowell Machine Shop.

1-6 gang Universal winder for cones or straight tubes.

The department is well equipped with all possible change gears and square parts and has a fine assortment of yarn reels, balances, scales, twist testers and strength testers.

The sod in front of Southwick Hall is a testimonial to the efficiency of the chemistry department. The instructors analyzed the soil which, while appearing strong at first, refused to support the growth of grass; upon supplying the lacking element, nitrogen, in the form of sodium nitrate, the grass flourished, and the sod has survived the hot summer very creditably.

The campus, about three acres in extent, has been graded, and is now seeded. When the turf is set, there will be laid out a running track, a foot ball gridiron, a base ball diamond, and tennis courts. The appearance of the buildings is much enhanced by the excellent grading of the field.

Former students are urged to advise the Principal of changes in their addresses and positions. It will surely be to their mutual advantage.

The fall classes open the latter part of September, students being received beginning Sept. 27.

Those desiring to avail themselves of courses should address the Principal.

There is already a large registration, both of former students who will return to complete their courses and of applicants for admission to the freshman class.

**WM. W. CROSBY,**  
**Principal.**

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#### **COURSE II—Wool Manufacturing**

The Yarn Department of Course II which includes the manufacture of woolen and of worsted yarns will begin the year 1904-1905 with a more complete plant than any other school in the world.

The generosity of C. G. Sargent's Sons of Graniteville, Mass., in installing a complete wool scouring plant consisting of one automatic feeder for scouring bowls; two scouring bowls, 17 ft. x 24 in.; one automatic feeder for dryer, and one single apron dryer will enable the school to teach practical wool scouring which has never been attempted by any school heretofore.

The possession of this plant will also allow the school to teach practical wool sorting for the wools that are scoured will first be sorted by the students.



WORSTED COMB

# BULLETIN

OF THE

# Lowell Textile School

Lowell, Massachusetts, U. S. A.



ISSUED QUARTERLY

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Entered Aug. 26, 1902, at Lowell, Massachusetts  
as second-class matter under Act of  
Congress, July 16, 1894

Moody Street and Colonial Avenue.

FOR BULLETIN AND TERMS ADDRESS WM. W. CROSBY, PRINCIPAL.

## **Power Weaving Department**

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Since the completion of the Head House and the removal of the warp preparation machinery, including spooling, dressing and slashing, to its permanent position, the development of the weave room proper along the lines originally proposed, has been rapid. Although the area is much in excess of that devoted to this department in the old home, it is found that in allowing sufficient space around each machine to enable it to be studied by the class, to good advantage, and with the continued additions of machinery, the space is none too large. The room itself is high posted, well lighted, ventilated and warmed. The shafting and drives are from below, thereby doing away with the evils of overhead belting, to say nothing of improving the general appearance of the room.

The productions of the power weaving department embody the yarns, the designs, the decoration and the coloring emanating from the several departments of the school. The equipment of this department at the present time is as follows:

### **The Cotton Warp Preparation Department includes:**

One spooler, one warper and one slasher, built by the Lowell Machine Shop, Lowell, Mass.

One beamer, made by T. C. Entwistle, Lowell, Mass.

One winder, made by Atlemus & Co., Philadelphia, Pa.

One 400-end improved Draper warper.

Drawing-in frames, etc.

One pat. slasher press roll, J. Battles & Co., Lawrence, Mass.

One pat. expansion comb for warper, T. C. Entwistle Co., Lowell, Mass.

One warper, Draper Co., Hopedale, Mass.

### **The Woolen and Worsted Warp Preparation Department includes:**

One warp spooler.

One dresser.

One reel.



The number of plain looms now running enables the department to handle the increasing classes and give each student the proper attention. This has been found of marked advantage where a student has a particular problem to solve.

Several new looms, in most cases specially constructed, are to be installed shortly, and it is to be supposed that this department will continually grow to include the latest and best developments in the line.

When it is remembered that the weaving constitutes about one-half of the cost of the production of the goods, it should be understood that too much importance cannot be attached to this department.

The Engineering Department co-operates with all of the other departments which deal in machinery; first, in teaching the students the subject of mechanical drawing and elements of mechanism, and second, in matters of applied engineering. A very interesting series of problems in this latter line is under way in the Power Weaving Department, in measuring the amount of power used by various looms under different conditions. The work is carried so far as to analyze the power used by a single loom to determine what portion is used by each of the separate mechanisms which make up the whole motion.

The Electrical Department takes charge of the calibrating and testing of the motors which are used as dynamometers.

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## NOTES

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Johnson & Bassett of Worcester, Mass., are building a bobbin winder for this department.

Mr. W. R. Moore has donated a 200 Hook Jacquard Head to be used on the tying up frame for purposes of instruction.

The Tremont & Suffolk Co. have sent over 8 plain looms, and one English overpick loom.

The Appleton Co., Lowell, Mass. has donated a hydro-extractor to the wool scouring room, and Schaum & Uhlinger have fitted it with a new engine.

Through the courtesy of the New England Bunting Co., a belted hydro-extractor has been placed in the Dyeing Department.



One Knowles fancy loom, with Jacquard tied up for leno.

One 1200-hook Halton Jacquard head motion arranged to be transferred to different looms.

One Knowles ingrain carpet loom, 4 x 4 boxes.

One Crompton gingham loom, 4 x 1 boxes.

One Crompton fancy loom, 6 x 1, with double cylinder, 20-harness dobby.

One Crompton fancy loom, with single cylinder, 20-harness dobby.

One Crompton jean loom.

One Stafford 36" 20-harness cotton loom, George W. Stafford, Readville, Mass.

One Stafford silk loom.

One Crompton lappet loom, with 16-harness dobby.

One Crompton towel loom, 2 x 1 boxes.

One Crompton ingrain carpet loom, 4 x 4 boxes.

One Crompton worsted loom, 24-harness, 4 x 4 boxes.

One Crompton & Knowles heavy loom, 20-harness, 4 x 4 boxes.

One Lewiston Machine Co. bag loom.

One Kilburn & Lincoln plain loom.

One Jacquard piano card cutting machine, from John Royle & Sons, Paterson, N. J.

One 2800-hook Halton tapestry Jacquard.

One 800-hook Jacquard, J. Battles Co., Lawrence, Mass.

One 200-hook Jacquard for instruction in tying up Jacquard harness.

It has always been the object of the school to teach in as direct and concrete a manner as possible. To this end, effort was made from the beginning to secure models of the numerous mechanisms found in the various machines; in many cases a portion of the machine itself was used as a model, so that the student could be taught at first hand. While the number and variety of looms in the original equipment was ample for the classes at that time, it soon became necessary to secure more than one loom of a given type, particularly in the case of standard machines. With the increase of floor space this is being carried out rapidly, so that there may be a sufficient number of looms available for use as models in the class room, where, elevated upon a suitable platform, they serve for demonstration purposes. This does not interfere with the work in the weave room proper, for there are enough looms left for operation.

One beamer.

One 48-spool creel.

All made by Davis & Furber Machine Co., No. Andover, Mass.

Two hand warping and beaming frames.

**The Power Weaving Department includes :**

One 24-line hercules braider.

One 12-line braider.

One tubular braider.

One Sautach braider, built by the New England Butt Co., Providence, R. I.

One plain Northrop loom; one improved Northrop loom, fine sateen; one Northrop loom, with dobby; made by the Draper Co., Hopedale, Mass.

One plain print cloth loom; one side cam twill loom; one twenty-harness dobby loom; made by Whitin Machine Works, Whitinsville, Mass.

One five-harness sateen loom, made by Lowell Machine Shop, Lowell, Mass.

One 400-hook Schaum & Uhlinger Jacquard, with Lowell Machine Shop loom, 2 x 2 boxes.

One plain print cloth loom, made by Mason Machine Works, Taunton, Mass.

One Harriman automatic shuttle changing loom, used for model instruction.

Eight plain looms, used especially for loom construction.

And the following looms made by the Crompton & Knowles Loom Works, Worcester, Mass., and Providence, R. I.:

One model dobby attachment.

One Knowles gingham loom, 4 boxes.

One Knowles fancy cotton loom, with 20-harness dobby, 4 boxes, for fancy leno work.

One Knowles fancy cotton loom, with 25-harness dobby.

One Knowles blanket loom, with 25-harness dobby, 4 boxes.

One Knowles gem loom, 20-harness, 4 x 4 boxes.

One Knowles worsted loom, 32-harness, 4 x 4 boxes.

Three Knowles heavy woolen looms, 25-harness, 4 x 4 boxes.

One Knowles fancy loom, with single lift Jacquard.

One Knowles fancy loom, with double lift Jacquard.



WEAVE ROOM.

BULLETIN  
OF THE  
**Lowell Textile School**

Lowell, Massachusetts, U. S. A.



*Textile Imports and Exports.*

*Industrial Germany.*

*Technical and Trade Schools.*

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ISSUED QUARTERLY

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Entered Aug. 26, 1902, at Lowell, Massachusetts  
as second-class matter under Act of  
Congress, July 16, 1894

**Moody Street and Colonial Avenue.**

This number of the bulletin contains papers upon two important subjects, viz: The great possibilities in the textile manufacturing field in this country, and the particular advantage of technical education.

America offers great opportunities in the production of the finer and higher grade textile fabrics, as may be seen from Mr. Smith's paper. Mr. Dodge shows clearly what technical education will do, and the Lowell Textile School offers a high grade education fitting for the various positions connected with this great industry where the field is so broad.

The equipment of the school—already of large proportions—is being augmented continually to keep pace with the growth of the industry.

Courses are offered in:

COTTON MANUFACTURING  
WOOL MANUFACTURING  
GENERAL COURSE  
CHEMISTRY AND DYEING

For further details, terms, and catalog, address

**WM. W. CROSBY,**  
Principal.

Data from Annual Review of the Foreign Commerce of the United States for the  
Year Ended June 30, 1904

**MANUFACTURES OF COTTON**

	IMPORTS		EXPORTS	
	YDS.	VALUE	YDS.	VALUE
Plain Cloths	1,415,512	\$ 159,102	156,060,778	\$ 9,256,922
Cloths Bleached, Colored, Printed, Dyed, Etc.†	50,031,957	8,144,383	91,319,973	5,439,277
Thread and Yarn		2,261,924		172,286
Knit Goods		6,044,691		
Laces, Embroideries, Edgings, Neck Ruffings, Etc.		24,848,764		
Wearing Apparel		2,505,035		2,700,420
All other		5,560,347		4,834,808
	<hr/> 51,447,469	<hr/> \$49,524,246	<hr/> \$247,380,751	<hr/> \$22,403,713

One pound of raw cotton will make about 2.85 yards of plain sheetings and shirtings. With raw cotton in the vicinity of nine cents per pound the raw material of a pound of manufactured sheeting cost from 11 to 12 cents, while the manufacturer receives but about 16 cents for the finished goods. Labor, profits, taxes, etc., therefore in making this class of goods represent but from four to five cents per pound of manufactured cottons. The coarse, plain cotton sheetings and shirtings made so largely until recently in the great textile district of the Merrimack Valley have made up the bulk of our shipments to China and other eastern markets, while the standard prints of Fall River find a large market in the West Indies and Central and South America.

At Fall River one pound of raw cotton will make seven yards of standard prints. These are now quoted at  $2\frac{7}{8}$  cents



per yard in the New York market or  $20\frac{1}{8}$  cents per pound manufactured. The raw material per pound should be slightly higher for printed goods, say 13 cents, leaving for labor, profits, taxes, etc., but seven cents per pound on manufactured prints. Against this we import in great quantities a class of cotton cloth of which Swiss muslin may be taken as a type. One pound of cotton makes 16 yards of sheer Swiss muslin which retails for from \$0.50 to \$1.00 per yard, or from \$8.00 to \$16.00 per pound of manufactured cotton.

It is for the reason that we were making cheap cloths with cheap labor (thus intensifying the labor problem), that our domestic manufacturers were last year compelled to stop buying cotton at inflated prices, while the foreign manufacturers continued to buy regardless of price, the raw material forming so insignificant an item in the cost of the high grade fabrics.

The Bureau of Statistics gives the number of yards of cotton cloths exported and imported and thus affords opportunities for comparison of value per yard. We exported 247,380,751 yards of plain and fancy cotton cloths valued at \$14,696,199 or  $5\frac{1}{2}$ + cents per yard. We imported of plain and fancy cotton cloths 51,447,469 yards valued at the customs at \$8,303,485 or 16—cents per yard. When we consider that the finer the grade of fabrics the smaller the percentage of raw cotton per yard usually we can comprehend how much larger a per cent. of skilled labor tc., enters into the cost to us of imported cottons.

### MANUFACTURES OF WOOL

	IMPORTS	EXPORTS
Carpets	\$ 2,797,308	\$ 50,921
Cloths	4,158,597	
Dress Goods	8,205,835	7,829
Flannels and Blankets		105,034
Wearing Apparel	1,309,995	1,457,758
Knit Fabrics	515,747	
Shawls	54,084	
Yarns	112,925	
All Others	579,297	366,396
	<hr/> \$17,733,788	<hr/> \$1,987,938

This showing needs no comment.

## MANUFACTURES OF SILK

	IMPORTS	EXPORTS
Dress Goods	\$14,228,328	Not sufficient
Laces, Embroideries, Etc.	4,864,318	for
Ribbons	1,978,013	separate classi-
Spun Silk	3,047,817	fication
Velvets, Plushes, and other pile goods	1,702,486	
Made Clothing	2,805,804	
Miscellaneous	3,346,914	
	<hr/> \$31,973,980	

## MANUFACTURES OF JUTE, HEMP, ETC.

	IMPORTS	EXPORTS
Bags	\$1,570,911	\$ 301,413
Cordage, Threads, Twine, Etc.	384,961	926,278
Carpets and Carpeting	61,944	
Coir Yarn	242,960	
Burlaps, Woven	14,630,647	
Linens	15,606,315	
Handkerchiefs	2,405,727	
Oil Cloths	1,201,070	
Twine—Binding	844,183	4,396,364
Yarns	372,269	
All Others	2,987,850	790,583
	<hr/> \$40,308,837	<hr/> \$6,414,638

## RECAPITULATION

	IMPORTS	EXPORTS
Manufactures of Cotton	\$ 49,524,246	\$22,403,713
“ “ Wool	17,733,788	1,987,938
“ “ Silk	31,973,680	
“ “ Jute, Etc.	40,308,837	6,414,638
	<hr/> \$139,540,551	<hr/> \$30,806,289

It appears from the foregoing that there is an ample domestic market for the extension of our textile industry into the manufacture of the higher, finer and more varied fabrics to say nothing

of the possibilities of the markets of the civilized foreign states, notably, Great Britain, Germany, Switzerland and France, from which we mainly obtain our high cost textiles. Such an extension however, demands broad, intelligent, and efficient scientific management, the essential features of which have been indicated by members of the most important scientific industrial association of this country -- the American Society of Mechanical Engineers. This Association has not only clearly demonstrated that the shorter hour and higher wage are consistent with high profits in the Mechanic Arts but are apparently essential thereto, as shown by Fred W. Taylor, M. E., of Philadelphia at the Bethlehem Iron Works. One important result was the creation of a sense of community rather than conflict of interest between employees and managers that is the sure guarantee of the success of a legitimate business enterprise. Necessarily there must go with such management, ample, liberal provision for scientific, technical, industrial education.

**JAMES T. SMITH**

## INDUSTRIAL GERMANY

A very important volume that the Bureau of Statistics, National Dept. of Commerce and Labor, has in press treats of industrial Germany. It is mainly a compilation of reports by Deputy U. S. Consul Meyer, at Chemnitz, Saxony, and correspondence with the London Times which have been published from time to time in the Daily Consular Reports during the last two years. These reports and correspondence are especially thorough in dealing with the German system of technical, industrial education.

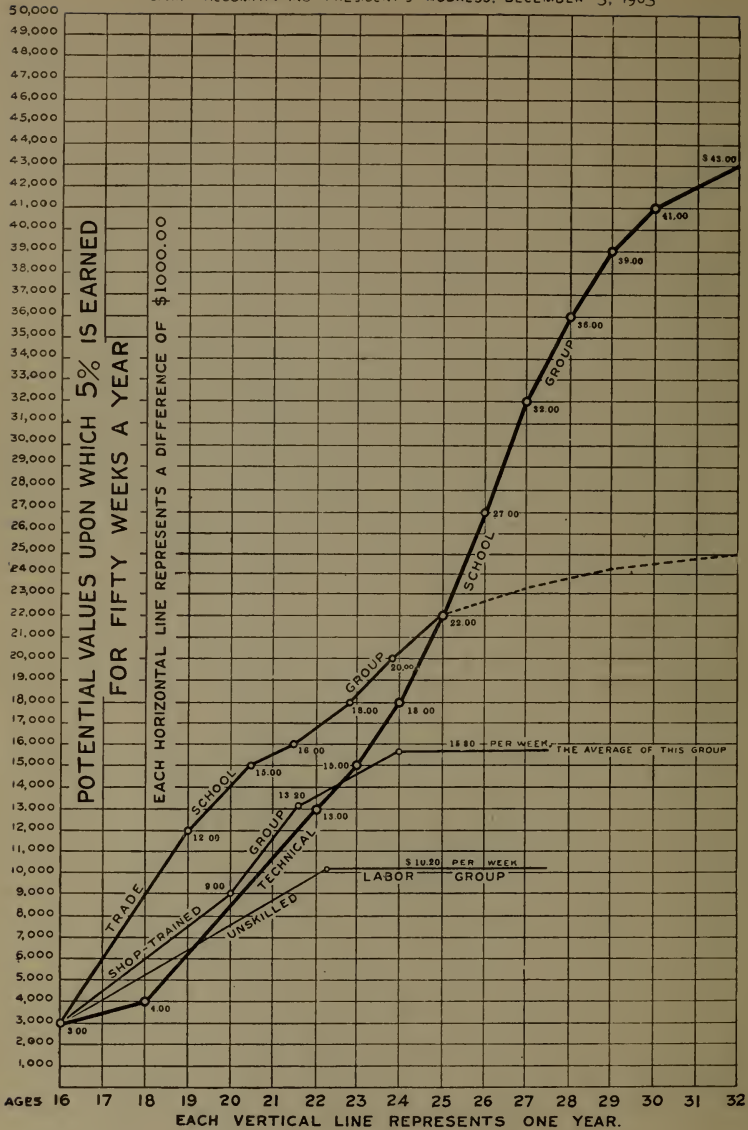
Because of the method of developing what is the most complete and efficient system of scientific, technical education yet established by a government, it is probable that complete statistics of the annual expenditures of the several German states on this account cannot be given, but certain facts seem to be established.

First, that Germany fully recognizes that its extraordinary development during recent years as an industrial and hence commercial nation is mainly due to this system of technical education.

Second, that to such industrial development is due the fact that Germany is able out of the wealth thus created to maintain itself as a first class power with the military, naval and civil establishments that such a position requires.

Third, that while availing themselves of private contributions by merchants and manufacturers, and encouraging them, a complete system of technical, industrial education, with schools that meet the needs of all classes, has been, or is being extended by the several state governments to every considerable city and village of the empire, and even into the purely agricultural eastern provinces, at the entire expense of the public treasury when private aid is wanting. Liberal provision is also made for the education of teachers for these schools; and with true German thoroughness, such expenditures are followed up by rigid government supervision of such expenditures and the curriculum and management of each school. Even the examination for graduation is conducted by state officials, or experts designated by them, though many of the schools are directly in control of representatives of the industry they are established to further.

J. T. S.



## THE MONEY VALUE OF TECHNICAL TRAINING

# The Money Value of Technical Training \*

BY JAMES M. DODGE, PHILADELPHIA, PA.

PRESIDENT'S ADDRESS, 1903.

1. Technical Training may be self-acquired or obtained through instruction. The ability to drive a nail properly, or to design and construct the most complex and wonderful of structures or devices, is the result of Technical Training in but different degree. Up to a very recent date, and within the memory of most of us, the Apprentice System and that of Independent Delving represented the sole methods of acquiring training. Research and investigation carried on in individual lines, with varying degrees of success, dependent upon the mental makeup of the individual, were the means of attaining theoretical technical knowledge. The blending of these two methods developed the earlier Mechanical Engineers and will, even in the future, enable those sufficiently gifted by nature and habit to attain eminence. The progress of the world, however, calls for a better and more speedy means of producing trained men than could ever be developed by the methods of self-instruction. The individual, striving for manual skill, attains his desire under the old apprentice system. Individuals sufficiently gifted arise above their fellows, and become the leaders in their calling. The gratification of a mechanical appetite and the desire to earn more money than his fellows are two moving causes which impel a man towards technical education. A generation or so ago, the universal belief was that the sooner a young man entered upon his apprenticeship, or began practical manual work, the better and more rapid would be his progress in the Mechanic Arts, and Book Learning was derided as being purely theoretical, and of

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\* Presented at the New York meeting (December, 1903) of the American Society of Mechanical Engineers, and forming part of Volume XXV, of the *Transactions*.

Reprinted in this Bulletin through the courtesy of the Author, James M. Dodge, Esq., who furnished the copy and the cut on the opposite page.



little practical value. This belief is, even at this date, all too prevalent, largely due to inherited error, and to lack of knowledge and reliable data.

2. Obtaining data from which incontrovertible conclusions can be drawn is now comparatively easy, but a few years ago was practically impossible. We are all prone to take extreme cases of success or failure as the basis of our opinions, and lose sight of the fact that it is the average man whose career shows the true force and direction of the current. For convenience of comparison, I will outline the actual progress made by four groups of men working in the Mechanic Arts, — the unskilled labor group, the shop-trained or apprentice group, the trade school group, the technical school group, and give the results attained. Each group I will refer to as an individual:

3. The first is the Laborer, with but primitive and rudimentary training, working under the immediate and constant supervision of a boss, and earning, as the line on the chart indicates, \$10.20 per week at the age of 22, his line remaining horizontal through the period of his usefulness. Data are lacking as to his progress before he reaches the age of 22.

4. The second is the Apprentice or Representative of the Shop-trained group, of good health and habits, entering a machine shop at the age of 16, and earning an average wage of \$3 per week for fifty weeks per year. This is about the number actually worked, making \$150, or 5 per cent. on \$3,000, which is his Potential or Invested Value, upon which he draws his interest on pay days.

5. On the chart accompanying this paper you will find, ruled horizontally, lines representing amounts increasing from the lower line upward by \$1,000 each; starting at \$1,000, and terminating at the top at \$50,000, these representing Potential Values, upon which 5 per cent. is earned for fifty weeks a year. The vertical lines each represent one year in time, beginning at the lower left hand corner at 16, and progressing in regular order until, at the lower right hand corner, we have 32, representing in all a lapse of 16 years.

6. To illustrate the progress of the four groups graphically, we indicate on the line representing 16 years of age, and opposite the figure \$3,000, the young man just entering his apprenticeship.

We will consider him typical of the Shop-trained Group. Following the line to the right we see his average progress in earning capacity through the ensuing years, noting that at the age of 20 he is earning \$9 per week, which is 5 per cent. on \$9,000, he having increased his Potential or Invested Value in four years by \$6,000.

7. We now note that his accumulated experience enables him to make more rapid progress for the next year and a half, and from the age of 20 to 21½ years we find that his pay has increased to \$13.20 per week, and his Potential Value to \$13,200. He is now approaching his goal, and his line of progress does not continue at the same angle that it followed for the past few years, but deflects toward the horizontal; and at the age of 24 we find him earning \$15.80 per week, and his Potential Value \$15,800. In other words, in eight years he has increased his Potential Value \$12,800. Observation shows that 5 per cent. of the apprentices acquiring the machinist trade rise above the line made by our average man; 35 per cent. follow the line closely, and that during the period of training 20 per cent. leave of their own accord, and as near as can be ascertained, go to other shops and continue in the line originally selected; 40 per cent., however, are found unworthy or incompetent, and are dismissed, probably never rising to the \$15.80 line.

8. Apprenticeship of today in many establishments, does not make the man, broadly speaking, a mechanic—in a majority of cases he is a specialist or tool hand, and not comparable with the old mechanic, who was a worker in metals, had some practical knowledge of steam and prime movers, could chip, file, work on lathe, planer, drill press, or as an assembler, and was competent to meet the varied and unusual conditions found in general construction and repair work.

9. The third group of young men are those fortunate enough to have had the opportunity of entering a trade school, which they do at 16 years of age, devoting the next three years of their lives, or until they are 19 years of age, acquiring a trade under competent instruction, and at the same time adding to their store of rudimentary theoretical education. At the age of 19 a Trades' School man enters the machine shop and can command \$12 per week, equal to the apprentice at 21 years of age, and very quickly makes his employment profitable to his employer. The three

years in school have increased his Potential Value from \$3,000 to \$12,000, a gain of \$9,000. Thus he has caught up with the apprentice entering the shop at 16, and who has been working for five years. Progress of the Trades' School group now follows a line which diverges from that of the regular apprentice, and by the time \$15.80 is earned by the regular apprentice, the Trades' School graduate is earning \$20, with a Potential Value of \$20,000, or \$4,200 greater than that of the Shop-Trained man. The Trades' School line continues at substantially the same angle up to an earning capacity of \$22 per week, and a Potential Value of \$22,000. Data are lacking as to the further progress, but the presumption is that this line will bear off more toward the horizontal, eventually paralleling the line of the Shop-trained man, but much higher on the chart.

10. The fourth group we will represent again by a boy of 16 studying at school until his 18th year, and preparing himself for admission to one of our higher Institutions of Technical learning, such as the Stevens Institute, the Massachusetts Institute of Technology, Columbia, Cornell and the like, where, after a four years' course, or at the age of 22, he is ready to begin practical work. The statistics upon which this chart is based show the average starting wage at \$13 per week, or the same amount earned by the regular apprentice at the age of  $21\frac{1}{2}$ , and by the Trades' School graduate at the age of  $19\frac{1}{2}$ . In other words, apparently a graduate of our technical schools has lost by his six years of preparatory study, having been beaten by the regular apprentice by six months and by the Trades' School graduate by  $2\frac{1}{2}$  years. From this time, however, there develops a most interesting and instructive line of progress. The regular apprentice, who is earning \$13.50 a week at the time the technical graduate is earning \$13, is overtaken in six months, and we find both earning \$14 per week, and the technical graduate reaches the \$15.80 line nearly one year before the regular apprentice. In other words, while it has taken the regular apprentice from his 21st to his 24th year, or three years, to increase his wages from \$11.50 to \$15.80 a week, the technical graduate has done the same in fifteen months.

11. Progress now continues on substantially the same line, and we find the technical graduate earning \$22 per week, and crossing the line of the Trades' School group in three years' time, a worthy tribute to the higher education and attainment.

12. The line of the technical graduate now continues divergent from that of the trades' school graduate, with earning capacity regularly increasing, and a corresponding augmentation of Potential or Invested Value until, at the age of 32, or ten years after entering upon the practical work, we find our technical graduate earning \$43 per week, and his Potential Value at \$43,000. In other words, six years of preparation have enabled him to distance the Shop-trained man and the Trades' School graduate overwhelmingly. Bearing in mind that this is an average line, it is of interest to say that most technical graduates with a better record than the one in the chart have devoted even more time to their preparation, either by study or by shop work, after graduation. Those, on the other hand, who have not come up to this average line represent, in the main, men more or less incapable of original work. The reason that higher education, other things being equal, carries with it the ability to earn high wages is that consciously or unconsciously, these men are directing and making it possible for large numbers of Laborers, Shop-trained men and Trades' School graduates to perform useful work. A draftsman at his board may never realize that as a result of his drawing a hundred men or more may be given employment. His design calling for structural steel, for instance, could not be built were it not for the labor of many men employed making and rolling the steel before it reaches the shop. Then come the shop men, who cut, punch and shear, and then the erectors, who assemble the structure in accordance with the original plan. For this ability and knowledge our technical man is paid.

13. It is quite obvious that all workers in the Mechanic Arts cannot be technical graduates. Some must, through natural limitations, or lack of opportunity, follow the apprentice line, and others the Trade School.

14. It is from graduates of the latter that leading shop men and foremen are largely selected. These two classes, supplemented by the technical graduate, constitute the vast army of workers in the Mechanic Arts.

15. Thus we see clearly that preparation pays, and that it pays in dollars and cents, and that even a long term of years spent in proper study and technical training is a good investment from every point of view.



16. Of course, apprentices have made and will make, in rare instances, a better showing than the average technical man of the chart, and many of our greatest men have, by sheer force of character, excellence of brain fibre, persistence and self-education, risen to preëminent positions, independent of all regular systems. To the end of time great examples of this kind will be found. Among those whose names readily come to mind are the elder Krupp, Joseph Whitworth, George M. Pullman, Andrew Carnegie, John Fritz, Prof. John E. Sweet, Edwin Reynolds, George H. Babcock and Coleman Sellers.

17. The same is true of the Trades' School graduate, but as said before, we are dealing with the average of each class, taken from actual statistics, with an earnest desire to ascertain the facts, and without any preconceived notion of the outcome.

18. It may be stated as a truism that every man pays for the amount or percentage of bossing he requires, and conversely, every man's wages increase in proportion to his ability to act as the boss or foreman of himself and others. The lower the wage rate the greater the amount of watching and directing constantly required. The slaves of ancient Egypt received no wages, but were treated as horses are today. They were fed and sheltered according to the ideas of their owners. No slave worked voluntarily, and the foreman's or leader's excellence was gauged entirely by his physical strength and efficiency as a driver. This was certainly the zero of labor conditions.

19. The highest wages are paid to the man through whose ability the largest number of other men may be most profitably employed. He does his work with his brain. Thus, on the one hand we see manual labor receiving no wages, and on the other mental labor reaping the highest reward. Between these two extremes is found every condition of human life.

20. A practical man performs his work within the radius of his arm, a technical man within the radius of his brain. This fact is, even today, realized by the few, but it is gratifying to know that the number is increasing.

21. The technical training of an individual makes him valuable just in proportion as his ability is manifested by good judgment and perception. Trained common sense receives the highest compensation and reaps the greatest reward.

22. Mental ability to receive ideas and impart them properly and wisely, rearranged and grouped, is typical of the most brilliant mentality; a dull intellect may be compared to blotting paper, fit only to absorb and inter a heterogeneous mass of impressions.

23. The most interesting of all graphical charts would be that properly exploiting the value of technical training to manufacturing plants and enterprises. To illustrate this more clearly, we may fairly assume that the apprentice of our chart corresponds to the old-fashioned primitive shop, having practically no overhead expense, the proprietor carrying the business "in his hat," priding himself on his non-receptive sturdiness, contempt for improvements and personal attention to all details. For his costs he adds together the value of raw materials and labor, and then adds a few dollars for profit. The line of this establishment would parallel the \$15.80 line of our Shop-trained group.

24. The Trades' School line on the chart truthfully represents establishments in which some attention has been paid to the improvement of system, with an increased so-called non-productive force, operating possibly in some particulars with brilliancy, but with defective features in others; acknowledging the value of improvement if internally originated; moderately but unconsciously absorbent of ideas from without, but tenacious of dogma and lacking departmental symmetry. Growth, increased earnings and relative immunity from disastrous failure result.

25. The technical graduate line of our chart represents the manufacturing establishment technically trained and "abreast of the times" in all particulars, and I predict a time not very far distant when it will be almost universally recognized that establishments should be trained as well as individuals, and that the marvellous development in scientific shop practice and management will do for the manufacturer fully as much as technical training is doing for the individual.

26. A change of mental attitude towards the subject of advanced Shop Practice and Management is noticeable to a marked degree. Within a very few years, indifference and antagonism have changed to a growing interest and appreciation.

27. The greatest musical composition contains no new notes; each note of the scale can be sounded on a penny whistle. Our greatest composers have only arranged the notes in harmonious se-



quence. The artists that can render their music truly, well deserve unstinted praise, even though they lay no claim to the composition of the masterpiece. Truly a listener at the grand opera could say, "There is nothing novel in this; I have heard every one of these notes before. I have even made similar sounds myself, and the result was far from satisfactory." So with Shop Management: it must be as fundamentally harmonious as a musical composition, and need not of necessity embody within it any one element of extreme originality. Of it the individual may truly say, "Nothing novel has been presented; I tried this feature or that feature with no beneficial result," but if he can play the music of the Art of Management thoroughly well he need not grieve because he is not its composer.

28. Henry R. Towne, F. A. Halsey, H. L. Gantt and Charles Day have all ably contributed through our Proceedings to the literature of this most important subject. Fred. W. Taylor, in his paper of the current year, while claiming no originality of detail, has presented to the world the most complete and thoroughly scientific system of shop management ever promulgated. As an investigator and student he is sowing seeds in the field of the Mechanic Arts which will bear a bounteous harvest.

29. It may be truly said that this Society, and others allied in promoting the Mechanic Arts, complete the system of technical training by going beyond the province of the technical schools, their students being the men who constitute the management of our manufacturing enterprises. It should be gratifying to all of us that the pioneer literature of advanced shop management and practice for this post-graduate course of technical training was presented to the world by the American Society of Mechanical Engineers.







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